Consumption of TOP 30 most popular mobile applications

Report conducted by

GREENSPECTOR

Atos

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Summary

1. Introduction

All our digital uses have an impact of energy consumption and more generally in technical resources (RAM, CPU, Data, ...). The environmental impact of digital is today important and especially in strong progression. Today, according to the ShiftProject, the impact of digital in terms of greenhouse gas represents 3.7% of all emissions on the planet and could represent, according to the assumptions, between 7 and 8.5% in 2025, the equivalent of GHG emissions light vehicles on the planet (8% of GHGs). This is reinforced by an annual growth of 8% which remains and will remain sustained despite technological progress. Access to information, content and services is now predominantly done on a smartphone that has become the flagship of the digital business. We connect more and more from everywhere and at any time. Today, the consumption of smartphones, (including the use phase and the manufacturing phase) represents 11% of the digital energy consumption. Sensitive point of this energy consumption for the smartphone that is at the battery and is the focus of all our attention and those of smartphone manufacturers. We often accuse our smartphones of lack and / or loss of autonomy... Yet it is the applications installed on the smartphone that consume! ... and which also degrade its battery capacity over time.

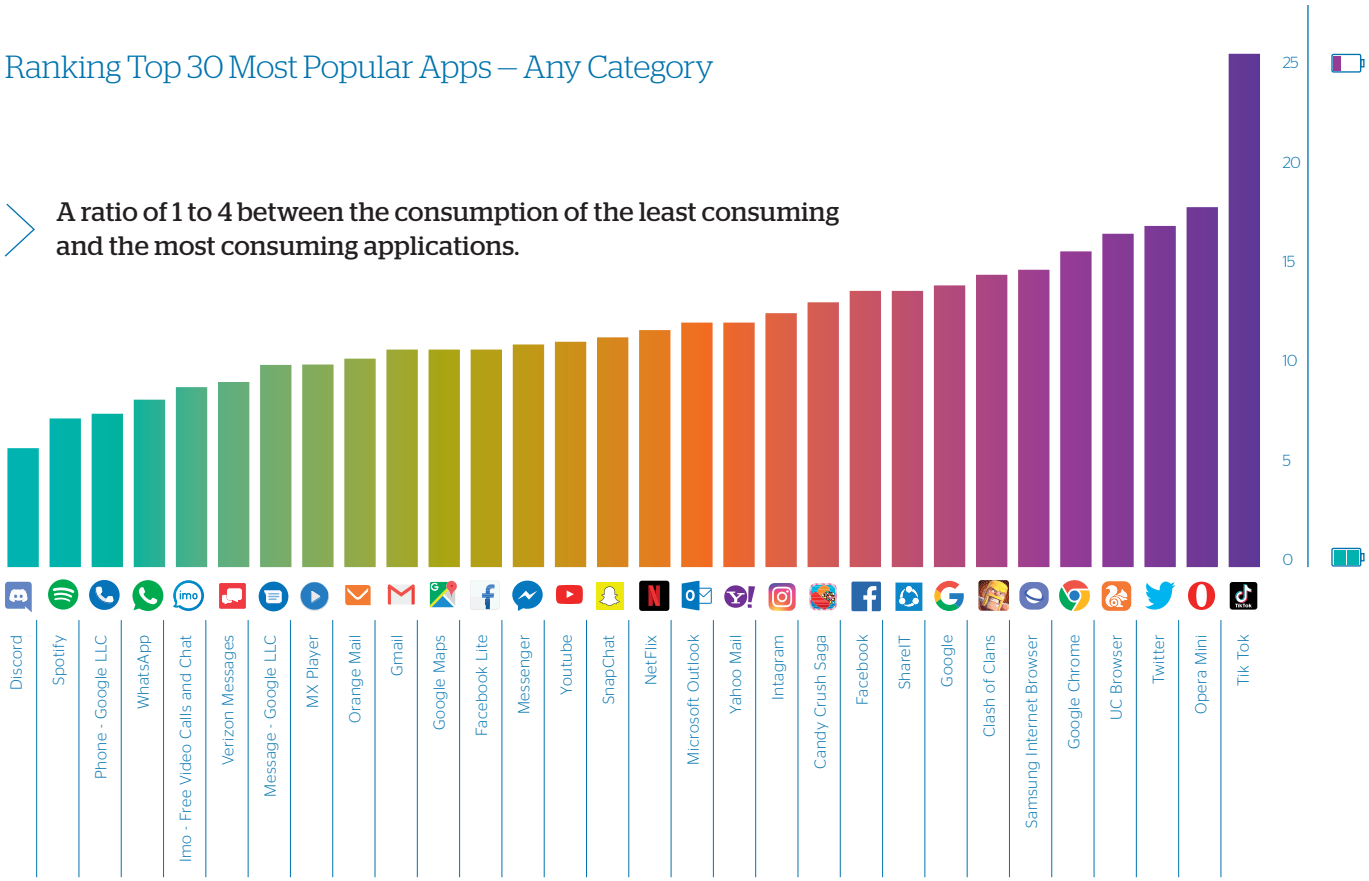
Mobile applications are now used for the most deployed by billions of people (more than 5 billion mobile users). Today, an application like Facebook, the most popular, is used by more than 2 billion active users per month on smartphone. The impact of these applications is therefore considerable and a significant improvement in the sobriety of one of them can have rapidly very positive consequences on the ecological impacts.

What is the power consumption of our mobile uses, which applications among the 30 most used in the world the least / most consuming?

2. Measurement results

Ranking Top 30 Most Popular Apps – Any Category

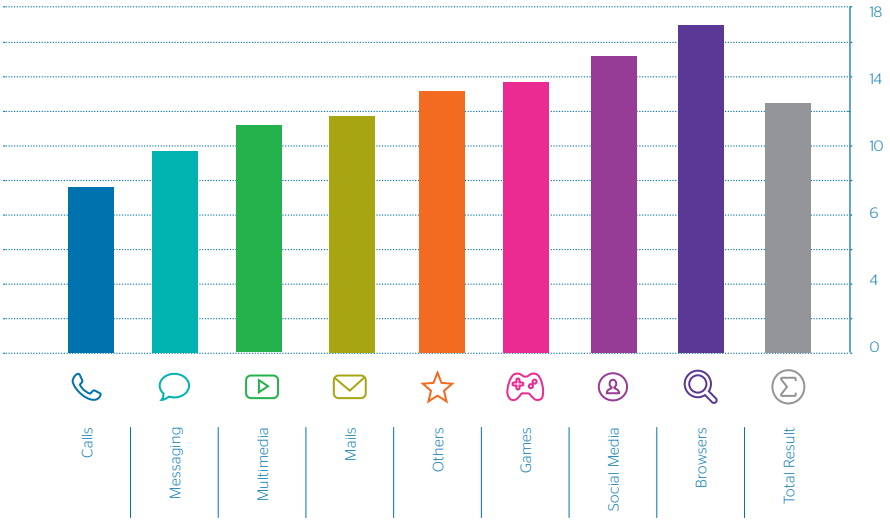
A ratio of 1 to 4 between the consumption of the least consuming and the most consuming applications.



*https://theshiftproject.org/en/article/lean-ict-our-new-report/

Average by category:

The ratio between the most and least consuming categories is 2. Web browsing, social networks and games are the most power draining. The category of call applications (excluding video call) is the least energy consuming.



We empty our smartphone twice as fast by surfing the web as by calling!

Browsers are the most consuming in our measurement. This does not only depend on the browser tool but also and especially websites that were launched during the measurement in this browser. If we launch browsers without surfing on web pages, we get very different results with applications that are the least consuming in average.

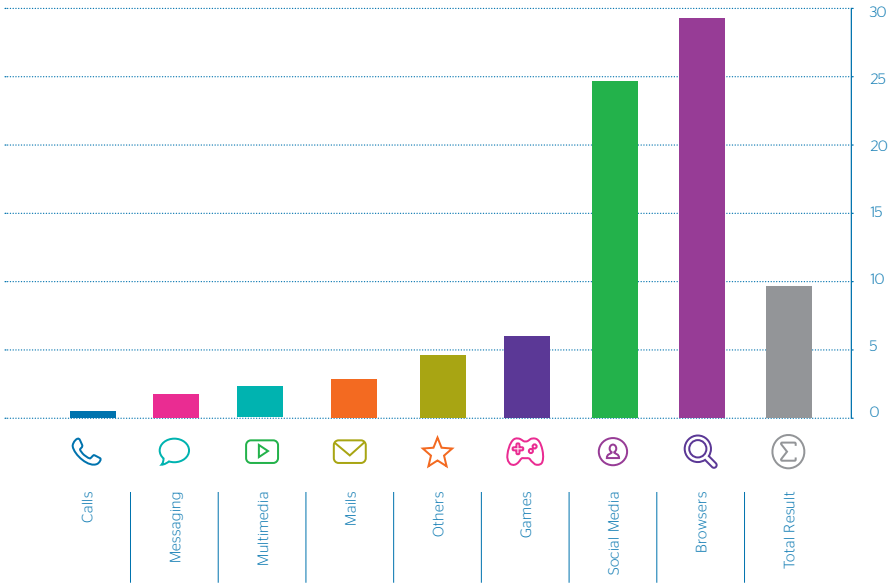
On data volumes (MB):

In terms of loaded data (in MB), we find social networks in first position. The multimedia category is closely behind all other categories.

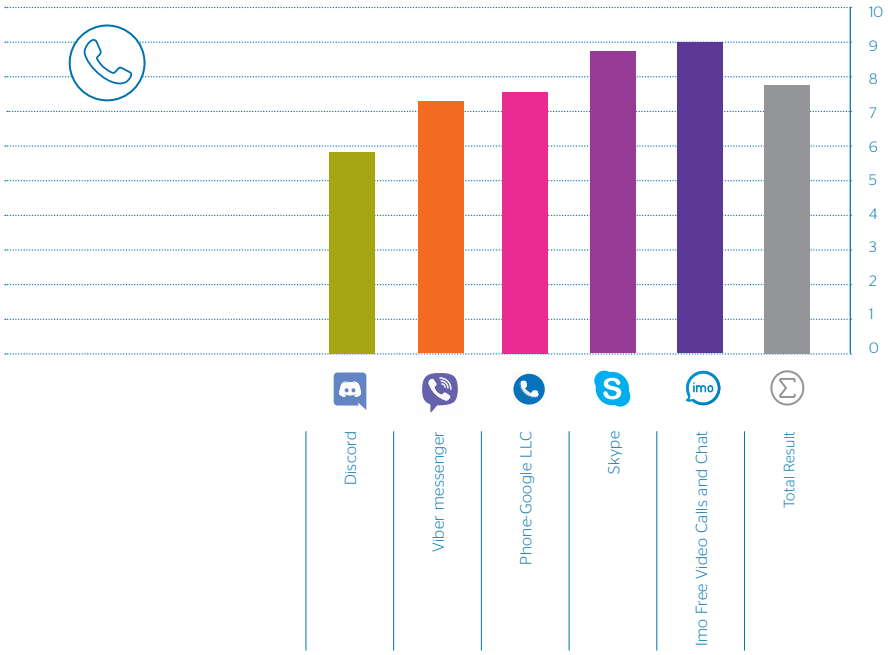
The fact that multimedia applications are not in the top of energy consuming (while they are in the top of consumption of data) is explained by the fact that once the data loaded on the smartphone, the technologies Graphics (GPU chips, rendering algorithms, etc.) are optimized and do not have a «strong» impact on consumption.

We notice that measured games do not consume data. Indeed the data consumption is done during the installation phase of the application (which is not taken into account in this classification). Most of the data is already present when you launch the application.

Finally, it is not so much the volume of data that penalizes the category of browsers but rather the embedded intelligence (script) but also including the tracking of user data.

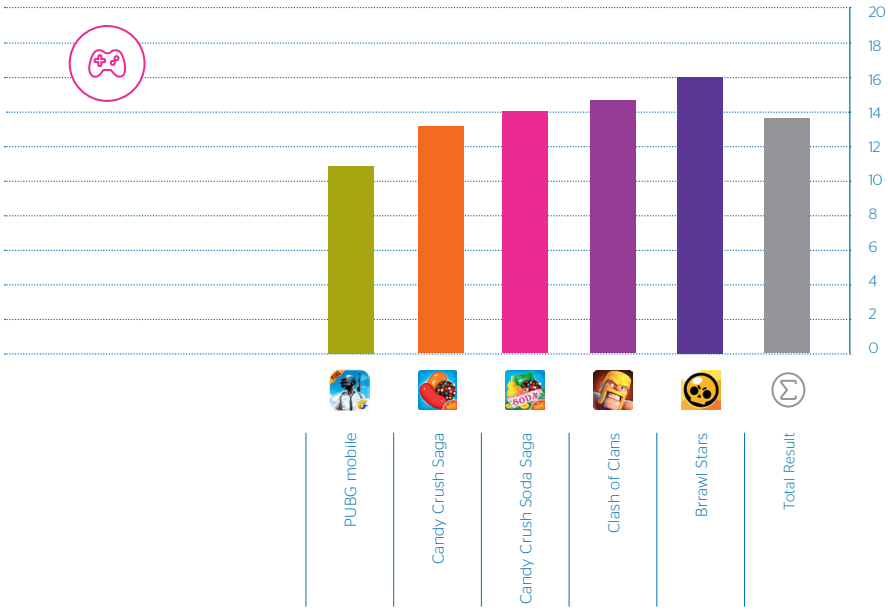


Ranking by Category



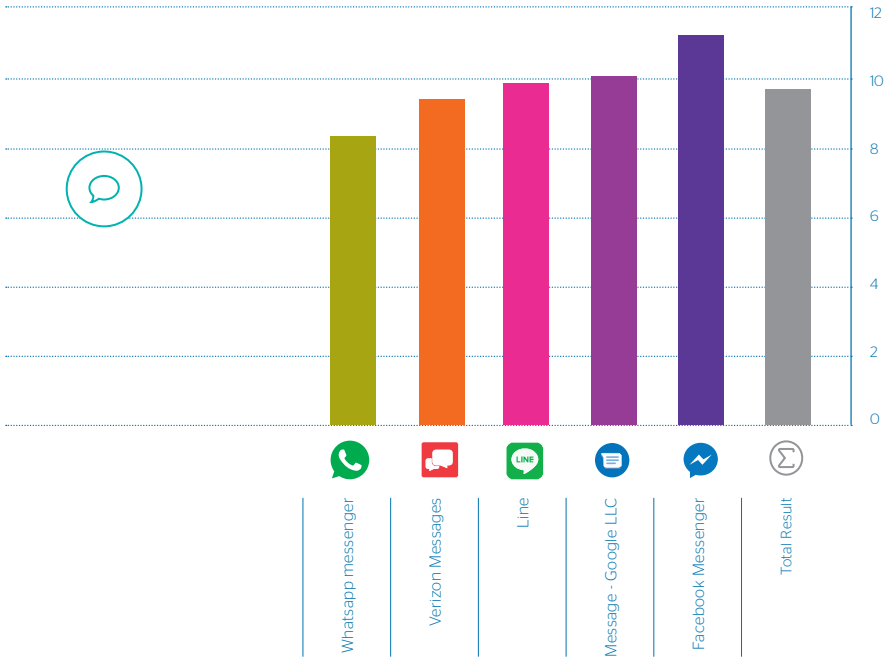
Call Applications:

The **Discord** app is a communication application for gamers. It is much less efficient than other call applications. The other 4 applications are close in terms of energy consumption.



Games :

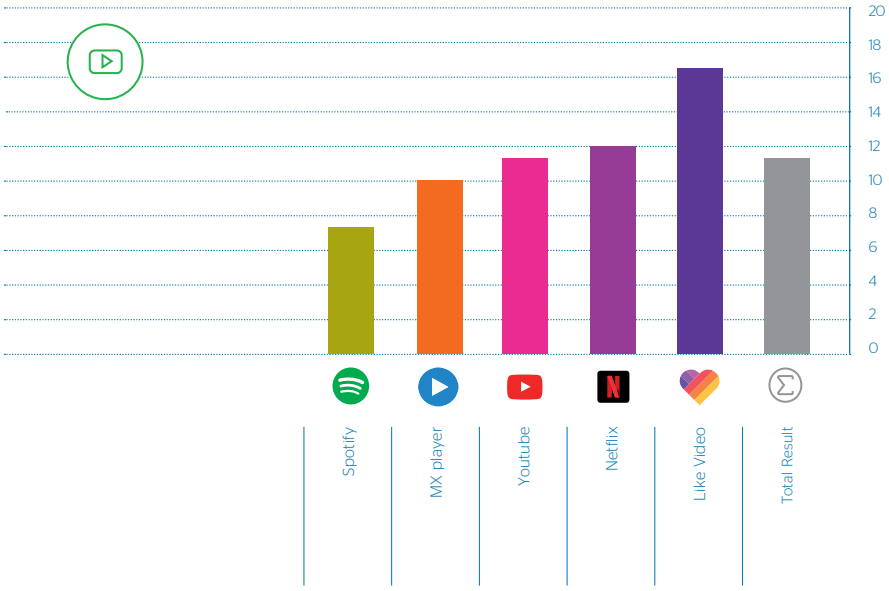
Energy consumption is different and this can be explained mainly by game implementations that do not require the same resource needs, mainly graphics. The winner in this category is **PUBG mobile.**



Messaging applications :

There is relatively little difference in this category (30%).

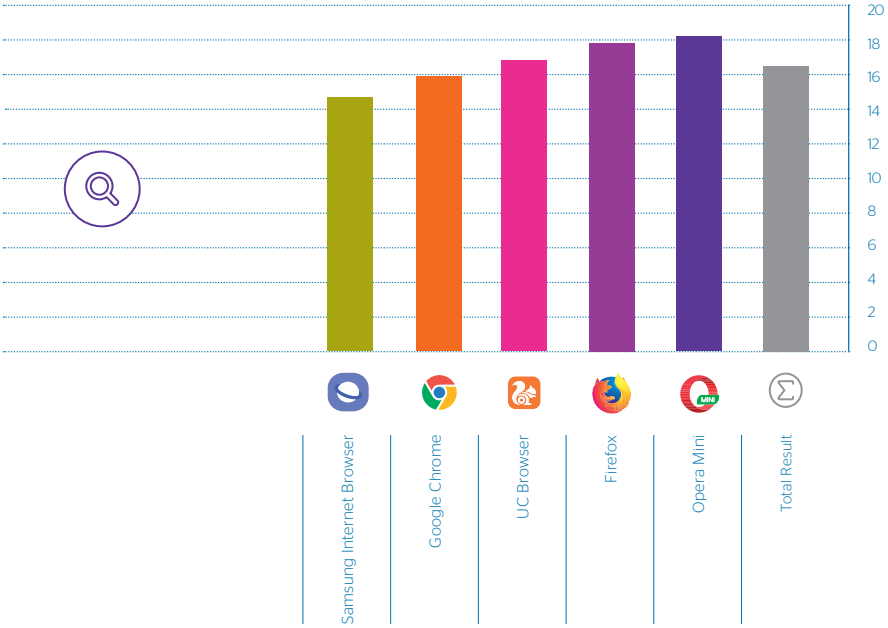
These applications include few features. **WhatsApp** is the least consuming app. Facebook Messenger, which occupies the last place, has launched a less consumer Lite version that we would like to see supplanted the «heavy» version.



Multimedia applications:

There are many gaps in multimedia applications: a ratio of more than 2 between applications.

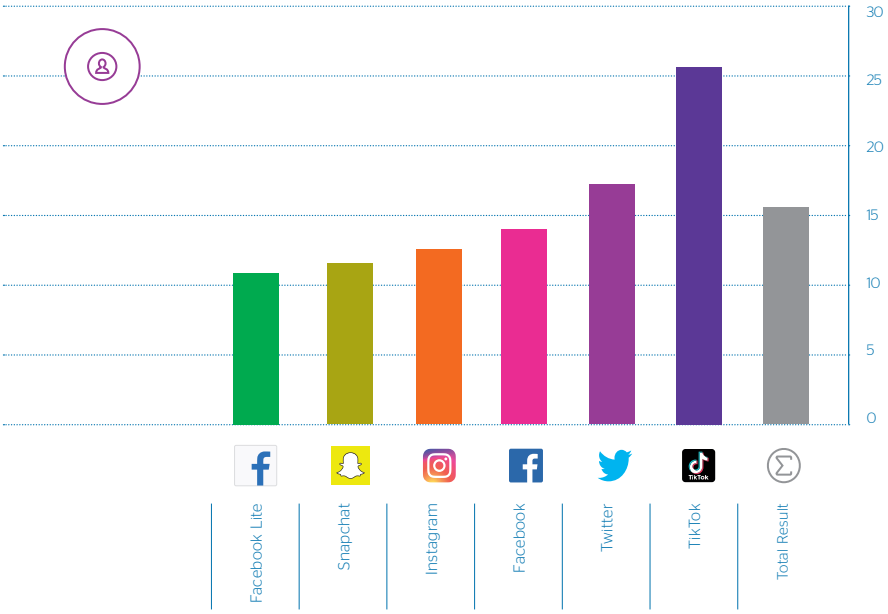
This is explained on the one hand by the features they will host (audio vs video here). It is clear that applications that deal only with audio will be less consuming. However in the uses it is observed that many users listen to music and display the associated video for example on YouTube. It is therefore important to take into account the use that the user will make of the application.
"**To reduce your consumption, use YouTube to watch videos and not to listen to music**"
In the same way the two applications of video visualization that are MX Player best video application of the category and Like Video have a totally different consumption. This can be explained by the fact that Like Video incorporates video editing features and many «gadgets» that make it a very power draining application.
For streaming applications (YouTube and Netflix), they are both close to the average in the category.



Browsers:

Little difference in consumption between browsers (20% difference).

It is not the browser that is expensive on energy consumption. The energy consumption of an open browser without navigation is multiplied by 1.8 compared to the consumption of a smartphone on the homepage. By browsing content and scripts that are integrated into the pages of sites, the consumption is multiplied by 3.7.
In the end, the average of this navigation is 2 times less important consumption if you stay on the browser without surf (average 8.04 mAh). Without surf, **Samsung Internet Browser is the least consuming app.**



Social Networks:

A gap of more than 100% between Facebook Lite and TikTok:

The excessive consumption of **TikTok**, which is **the most consuming application of the Top 30** also, comes from the way the application loads videos: when we roll out the timeline, all videos are loaded even if the user does not have them. Not visualize. This consumption is confirmed by the data: **over 134 MB charged for 1 minute!** This is a record for measured applications.
The difference between Facebook Lite and Facebook (24%) shows that it is better to use Lite versions of applications (Messenger, Facebook, and others ...). These versions often respond to inclusion issues business "for markets or regions of the world where the network flow is less good and / or there are stronger requirements on low-tech hardware or older".

3. Projection of consumption

Assumptions retained

Breakdown in minutes of use selected on the basis of an average time spent of 3 hours:

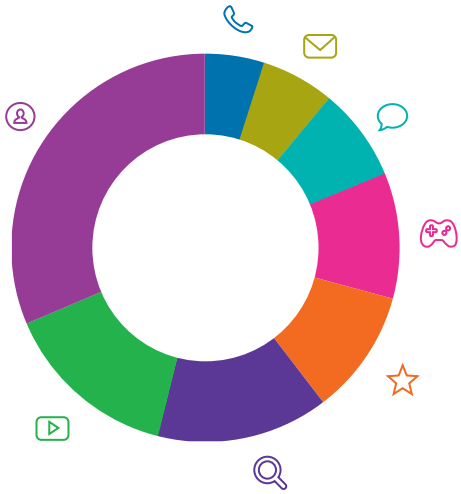
Social Network	48,15
Multimedia	30
Mail	12
Messaging	19
Voice call	15
Games	17,34
Browsers	19,8
Others	19

Number of users with a mobile phone: 5 billion.

Projections

Projection at the user level

The projection based on average usage coupled with the average consumption by category allows to see the distribution of energy consumption in the user during the day.



The projection of the usage time of 3 hours according to the distribution adopted leads us to an average consumption of 2300 mAh per day, or for a 3000 mAh phone battery (corresponding to the smartphone measured), **77% of its Battery life capacity.**
We understand why we have to charge our smartphones every day:

- 31% The consumption of social networks is the first cause of ecological impact on our smartphone but also the first reason for the discharge of users' batteries. This is due to both the average usage time and the high consumption of these tools.
- 15% Identical situation for multimedia applications which are in second place of impact and which are also very used on smartphones.
- 14% It's a little different for web browsing that comes in 3rd place. The use is relatively low at about 11% of the time spent on average with a high consumption for each use

When integrating the time out application, it is necessary to take two types of state of the smartphone:

- Idle time of 30 minutes per day which corresponds to the average duration when the phone is switched on but the user does not act with the latter, for example the screen on the homepage before a bet Standby.

- The standby time which is the moment when the phone is in standby mode (screen off, no use of the phone ...) and which corresponds to about 1 / 10th of the consumption of a phone in idle.

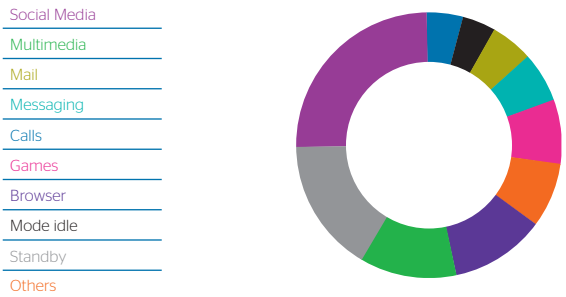
When we take idle and idle consumptions, we get a consumption of more than 3000 mAh (100% of the battery). Social networks are always in first place. We find the previous day in second place.

Worldwide projection

When we project this consumption on all smartphone users, we obtain a total consumption of **20,3TWh.**

- a little less than the equivalent of **the annual electricity consumption of a country like Ireland (5 million inhabitants) or it of Ecuador (16 million inhabitants)***
- or the equivalent of **3 nuclear units** of 7 TWh

This estimate is close to that of the Lean ICT Shift Project working group that reaches a consumption of 30 TWh in 2017**



Projection of potential gains

If the average of the applications was positioned on the best measured category (Voice call), we could increase by 1000 mAh, or 1/3 of the capacity of the battery of the smartphone and the annual consumption more than 6 TWh on the world consumption, that is to say almost the equivalent of a nuclear unit.
In contrast, it is highly possible that applications consume more and more if they are not optimized. If all applications consumed as the worst category (social networks), we would have an overall increase of 3TWh per year.

*Source : https://en.wikipedia.org/wiki/Electric_energy_consumption

**Source : https://theshiftproject.org/wp-content/uploads/2019/04/Lean-ICT-Materials-Liens-%C3%A0-t%C3%A9l%C3%A9charger-V3.pdf)

Improvements Track

It is possible to reduce the global consumption of smartphones via different simple ways:

- On multimedia applications, an adaptation of the data for the use of the users can be applied. For example, many mobile users use Youtube to only listen to music. By only broadcasting the audio stream (and thus suppressing the video stream), significant gains could be achieved. The consumption of Youtube for example would return to that of Spotify (6% gain). This confirms the assumptions of the 2019 study***.

- In the same way, adapting multimedia application streams to the platform and the connection speed of the user would reduce consumption. This technique is already partly applied to the connection for solutions like Netflix. YouTube offers the possibility to modify the definition. However these options are still marginal and not visible to all users.

- Web browsing is very consumer and requires the application of good practices to avoid BloatWare. Need to optimize images, reduce tracking tools, limit the impact of advertising ... It is necessary to go beyond good performance practices but to go towards eco-design features and efficiency taking into account the resources used.

- The social networks are sinkholes of consumption, an optimization of the multimedia flows (images, video, gif ...) is necessary but it is also essential to offer options to the user to reduce its impact (for example not to display the gifs or images). Some publishers like Facebook publish a «light» application like Facebook Lite that reduces this impact. In our study, Messenger Lite consumes 24% less than Messenger.

- Adapt the design to the technologies. Example, set up dark themes for AMOLED screens.

- Overall, it is necessary to control the energy and data consumption of applications. For this purpose the measurement of this impact continues throughout the manufacturing cycle and during the life of the application is necessary. Without this, their obesity can't be measured and therefore curbed.

*** Source : http://www.bristol.ac.uk/news/2019/may/rethinking-digital-service-design-.html.

Annex: Methodology / hypotheses

Etude réalisée par

GREENSPECTOR

Atos

4. Annex – Scope of measures

Choice of Top 30

Terms of choice of applications
Based on SimilarWeb rankings of 21 April 2019 based on the last 28 days and including both current installations and active users for 3 European, Asian and American countries, we have performed a scoring of applications based on a top 50 in each country.

The AppAnnie ranking of the top 2018 applications downloaded from a global top 10 has allowed to award new points for the present applications. In this ranking obtained, we selected the testable applications in France and measurable.

The 39 applications measured
(top 30 and top 5 categories)

	Applications	Popularity Ranking	Category
1	Facebook	192	Social Media
2	WhatsApp messenger	189	Messaging
3	Facebook messenger	178	Messaging
4	Instagram	175	Social Media
5	Google Chrome	145	Browser
6	Google	144	Other
7	YouTube	144	Multimedia
8	Gmail	142	Mail
9	TikTok	140	Social Media
10	Google Play services	135	Other
11	Snapchat	127	Social Media
13	Spotify	102	Multimedia
14	Message - Google LLC	93	Messaging
15	Netflix	91	Multimedia
16	ShareIt - Transfer & Share	86	Other
17	Samsung internet Browser	78	Browser
18	Yahoo Mail	67	Mail
19	UC Browser	66	Browser
20	Google Maps	65	Other
21	Microsoft Outlook	62	Mail
22	Facebook Lite	61	Social Media
23	Candy Crush Saga	54	Games
24	Twitter	52	Social Media
25	Discord	46	Calls
27	Phone - Google LLC	42	Calls
29	MX player	38	Multimedia
35	Orange Mail	35	Mail
36	Verizon Messages	34	Messaging
37	Clash of clans	33	Games
38	Like Video	33	Multimedia
39	Candy crush Soda Saga	32	Games
50	Viber messenger	26	Calls
61	Firefox	20	Browser
66	PUBG mobile	18	Games
67	Brawl Stars	17	Games
101	Line	-	Messaging
102	Skype	-	Calls
103	Mail.ru	-	Mail

To achieve these rankings, we selected the applications according to their place in the overall ranking.

Based on the Top 30, we decided to group apps by category.
Proposal to make 7 categories: calls, games, mails, multimedia, social networks, browsers, others and to be able to compare 5 applications by category (Top 5 by category).

In the categories Call, Messages and Mail, it lacked an application to achieve the top 5. 3 applications not included in the top 100 were added (Skype, Line and Mail.ru) for a presentation by category of 5 applications minimum. They were chosen based on the number of downloads on the Google Play store.

Some applications could have been in two different categories. Example: Viber and WhatsApp are applications that have similar functionality but they are not used for the same main purpose and therefore not in the same category and were therefore measured in two different scenarios, one in the Voice Call category and the other in the Messaging category.

5. Annex – Measurement protocol

All measurements were made on Nexus 6, Android 6 corresponding to a mid-range smartphone desktop WiFi network.
All the applications were measured over an equivalent duration of 1 minute on the basis of 3 measurements whose average value is calculated.
In the event of a measurement that causes a significant standard deviation greater than 10% between the 3 measurements without an identified reason, a new measurement is performed.
If you observe a standard deviation linked to an advertisement or other «uncontrolled» event but which is part of the application's operation, we keep this value in the average.
For each category of applications, the course is based on the same navigation time and on the same navigation principle, namely for:

- Social networks Facebook, Facebook Lite, Instagram, Snapchat, TikTok, Twitter: opening the application and scrolling within the timeline.
- Browsers Firefox, Google Chrome, Opera Mini, Samsung Internet Browser, UC Browser: open the browser, search for a site, open the site, scroll then search for a second site, open the site, scroll.
- Games Brawl Stars, Candy Crush Saga, Soda Saga Candy Crush, Clash of Clans, Mobile PUBG: opening the app and launching the game.
- Messaging tool Facebook messenger, Line, Message - Google LLC, Verizon Messages, WhatsApp messenger : opening the application, selecting a contact, writing a message, sending / done 2 times.
- Mail Gmail, Mail.ru, Microsoft Outlook, Orange Mail, Yahoo Mail : opening the application; drafting of a new mail with attachment of 2.35 MB attached. Then consult an email and finally scroll on the inbox.
- Multimedia Like Video, MX player, Netflix, Spotify, YouTube : opening the application, launching a search and selecting a video or music, play video or music
- Voice calls apps Discord, Imo Free Video Calls and Chat, Phone - Google LLC, Skype, Viber messenger : opening the app, choosing a contact to call, and making a call without video.

Applications not categorized

- Google Maps: open the application, search for a specific address, follow the route.
- Google: opening the application, launching a search and then view the results of different categories (Images, Videos, news etc ...) by scrolling down the first search screen.
- ShareIt: opening the application and browsing the various tabs of the application.

6. Annex – Details of the measures

Site	Version	Category	Consumption (mAh)	Data
Discord	8.6.8	Calls	5,88	0,09
Spotify	8.5.2.759	Multimedia	7,51	7,48
Viber messenger	10.5.0.28	Calls	7,52	1,12
Phone - Google LLC	14.0.176716531	Calls	7,67	0,01
Whatsapp messenger	65.23	Messaging	8,48	0,01
Skype	8.43.0.53	Calls	8,92	1,04
Imo Free Video Calls and Chat	9.8.000000011831	Calls	9,03	0,21
Verizon Messages	6.8.2	Messaging	9,27	0
Line	9.6.1	Messaging	9,89	0,16
Message - Google LLC	2.7.030	Messaging	9,98	0
MX player	1.10.51	Multimedia	10,16	23,61
Orange Mail	3.19.0.1	Mail	10,41	2,76
PUBG mobile	0.12.0	Games	10,86	0,68
Gmail	7.11.5.177402951_release	Mail	10,99	2,78
Google Maps	9.67.1	Others	11,06	0,55
Facebook Lite	143.0.0.13.111	Social Media	11,09	4,34
Facebook Messenger	212.1.0.13.109	Messaging	11,26	8,74
Youtube	14.10.53	Multimedia	11,36	23,84
Snapchat	10.55.5.0	Social Media	11,42	0,53
Netflix	7.7.0_build_20.34181	Multimedia	11,96	61,98
Microsoft Outlook	3.0.46	Mail	12,14	10,22
Yahoo Mail	5.39.4	Mail	12,4	3,45
Instagram	90.0.0.18.110	Social Media	12,74	15,57
Candy Crush Saga	1.148.0.4	Games	13,32	0,43
Facebook	218.0.0.46.109	Social Media	13,76	8,82
ShareIt - Transfer & Share	4.7.68_ww	Others	13,84	4,27
Google	7.17.25.21	Others	14,01	3,12
Candy Crush Soda Saga	1.136.4	Games	14,14	5,71
Clash Of Clans	11.446.24	Games	14,68	1,16
Samsung internet Browser	9.2.00.70	Browser	14,99	7,59
Google Chrome	41.0.03578.99	Browser	15,85	5,14
Brawl Stars	17.153	Games	15,98	0,03
Like Video	2.16.5	Multimedia	16,42	5,79
UC Browser	12.11.2.1184	Browser	16,79	4,68
Twitter	7.93.1_release.49	Social Media	17,19	12,14
Firefox	66.0.2	Browser	17,9	8,56
Opera Mini	40.1.2254.138129	Browser	18,14	2,71ls
TikTok	10.8.0	Social Media	25,59	134,54
Mail.Ru	9.3.0.26805	Mail	13,17	1,99

7. Annex – Sources for the projection

- The average daily time spent on applications has increased significantly compared to 2016, it is now 3 hours on average per user on Android. Social networking applications account for 50% of total global application time in 2018, followed by video applications at 15% and games at 10%.

- 685 billion hours dedicated to social networks and communication tools around the world in 2018 that correspond to about 50% of the time of use.

Time spent on mobile apps on total time

Social Networks	20%
Multimedia	38%
Games	10%
Browers	11%

Source AppAnnie: https://www.appannie.com/insights/download/fr-the-state-of-mobile-in-2019-the-most-important-trends-to-know/1901_State_of_Mobile_Main_EN.pdf

@Source Comscore 2017 : http://www.appyourway.com/2017_Mobile_Report.pdf

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