

D2.1.3, D2.1.2, D2.2.1

## Household's energy literacy and flexibility survey

-energy literacy platform and datasets

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This report documents the Energy Literacy Platform deployed as part of Task 2.1 and the anonymized user profiles collected with this platform during the energy literacy and flexibility survey conducted within WP2 of the FlexBeAn project (see D2.1.4).

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# 1. Platform overview

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This section describes the technical implementation of the Energy Literacy Assessment platform of the FlexBeAn project. It focuses on the different methods of access to the Energy Literacy Assessment survey (called *the survey* in the rest of this document) and the technical implementation of the IT solution supporting it. For more details about the survey questionnaire itself, refer to D2.1.4.

The platform described here also implements the data collection pipeline required in the context of WP1 to gather smart meter data via the Smarty+ app.

All relevant links are documented in the

Useful [Links](#) section.

## 1.1. Energy literacy assessment survey

The energy literacy assessment survey was made accessible to different groups of consumers, as illustrated in Figure 1:

- to Smarty+ users via the Smarty+ app
- to non-Smarty users through external communication channels (e.g. CREOS may email its customer base).

The following sub-sections describe in detail how each user group is expected to gain access to the survey. We start with non-Smarty+ users as it is the most straightforward flow and then describe the flow for the Smarty+ users.

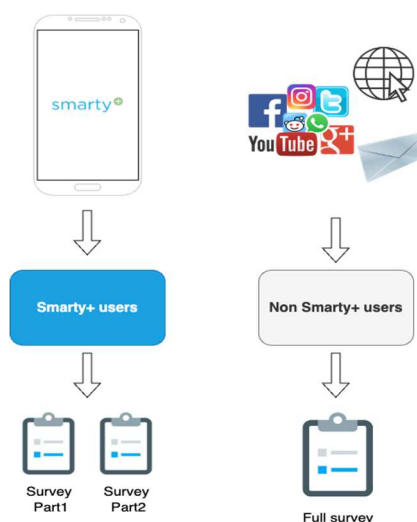


Figure 1 Overview of the two user

### 1.1.1. Access to the survey for non-Smarty+ users

A first approach to make the survey accessible to consumers is by disseminating (e.g. via email, social-media campaigns) a simple link to the full survey. In this scenario, the consumer answers the survey completely anonymously and no link to Smarty+ data can be established. Figure 2 documents the process the user must follow to access and complete the survey using this method.

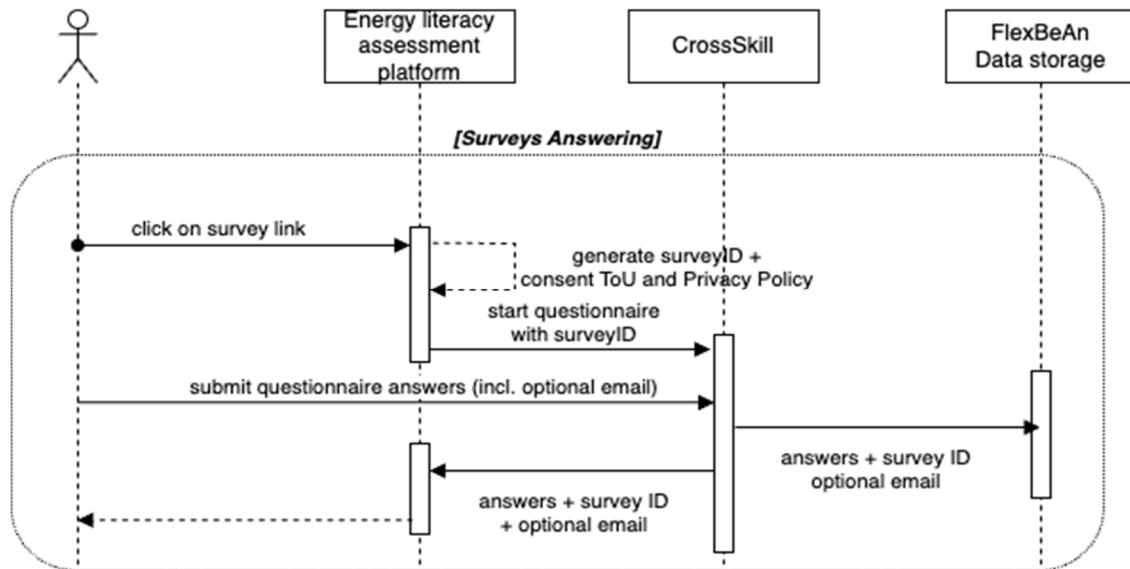


Figure 2 Sequence diagram describing how the survey will be disseminated to the general-public.

Assuming the link is disseminated by email or on social media, the users just need to click the link. They get redirected to a webpage providing contextual information about the survey (e.g., short description, link to privacy notice...). At this moment, the webpage has generated a random surveyID. When the users click the "start" button on this page, the survey questionnaire starts. To proceed, they need to accept the survey Terms of use and Privacy Policy. Once the user submits the full questionnaire, their answers are saved, associated with their surveyID, on the project file storage system. The answers can optionally contain the user email if they agree to share it with us. They are then redirected to a webpage of the platform where the surveyID is displayed and they are presented with a summary of their answers.

This surveyID must be included in any request from the consumer regarding modification/deletion of data.

### 1.1.2. Access to the survey for Smarty+ users

For Smarty+ users, the flow is a little more complex as it involves the following steps:

- registration of an account on the Energy Flexibility platform.
- activation of the FlexBeAn smarty+ service. This requires that the user provides an activation code.
- access to the survey. For these users, the survey is split in two independent parts:

- o a short first part gathering answers required for WP1 analysis
- o a longer second part gathering answers required for WP2 analysis

Figure 3 documents the full process for Smarty+ users.

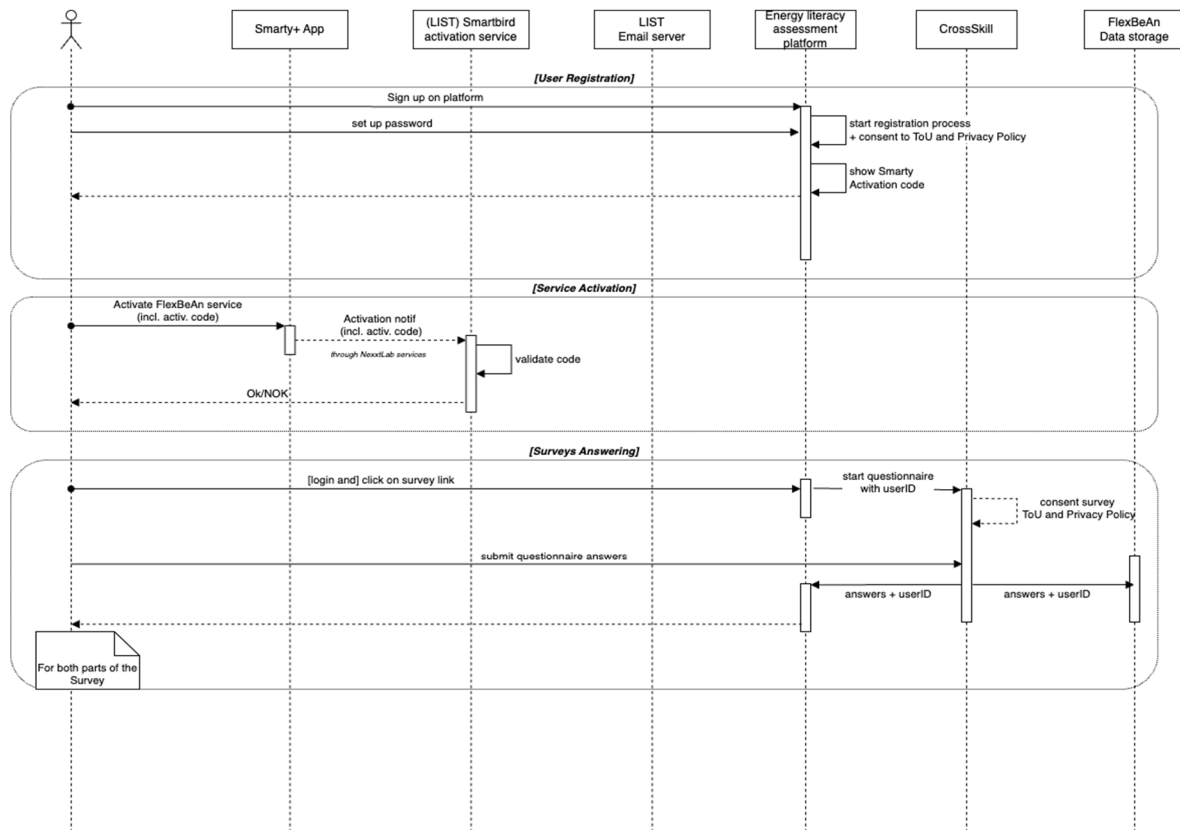


Figure 3 Sequence diagram documenting how Smarty+ users are expected to access the survey.

In this scenario, the user registers an account on the Energy flexibility platform. During the registration process, we gather the user consent to the processing of their data. At the end of the registration process, the system provides the user with an activation code that can be used in the Smarty+ app to activate the FlexBean service.

From the Smarty+ app, the user provides their activation code and proceeds with the service action. Consent to establish the data connection between the Smarty system (Nexxtlab's smartbird) and the flexbean system. The FlexBeAn system validates the received activation code to finalise the service activation.

Right after registration on the platform, the user is redirected to the first part of the survey. Should they stop the process here, only the link to this first part of the survey will be available in the platform the next time they log in. After the user completes the first part of the survey, the link to the second part becomes available in the platform.

When submitting a survey questionnaire, the user answers are saved to the project data storage, associated to their userID. This id will allow to link the answers to the smart meter data gathered from Nexxtlab.

In this scenario, the email of the users is the key to link the survey results to the smart meter data as illustrated in Figure 4.

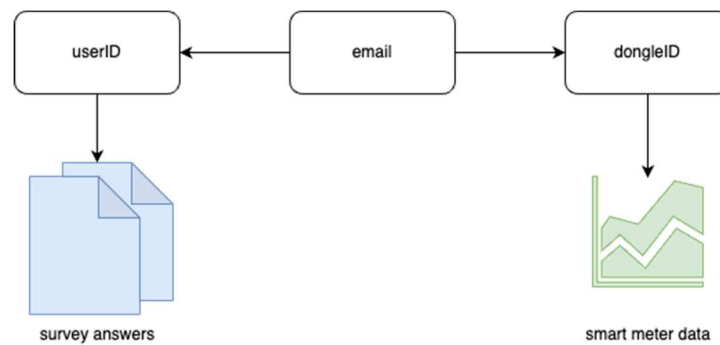


Figure 4 The link between the survey results and the smart meter data of Smarty+ users is done via the user email.

## 1.2. Platform technical architecture

Figure 5 provides an overview of the technical architecture of the Energy Literacy Platform, as deployed during the FlexBeAn project.

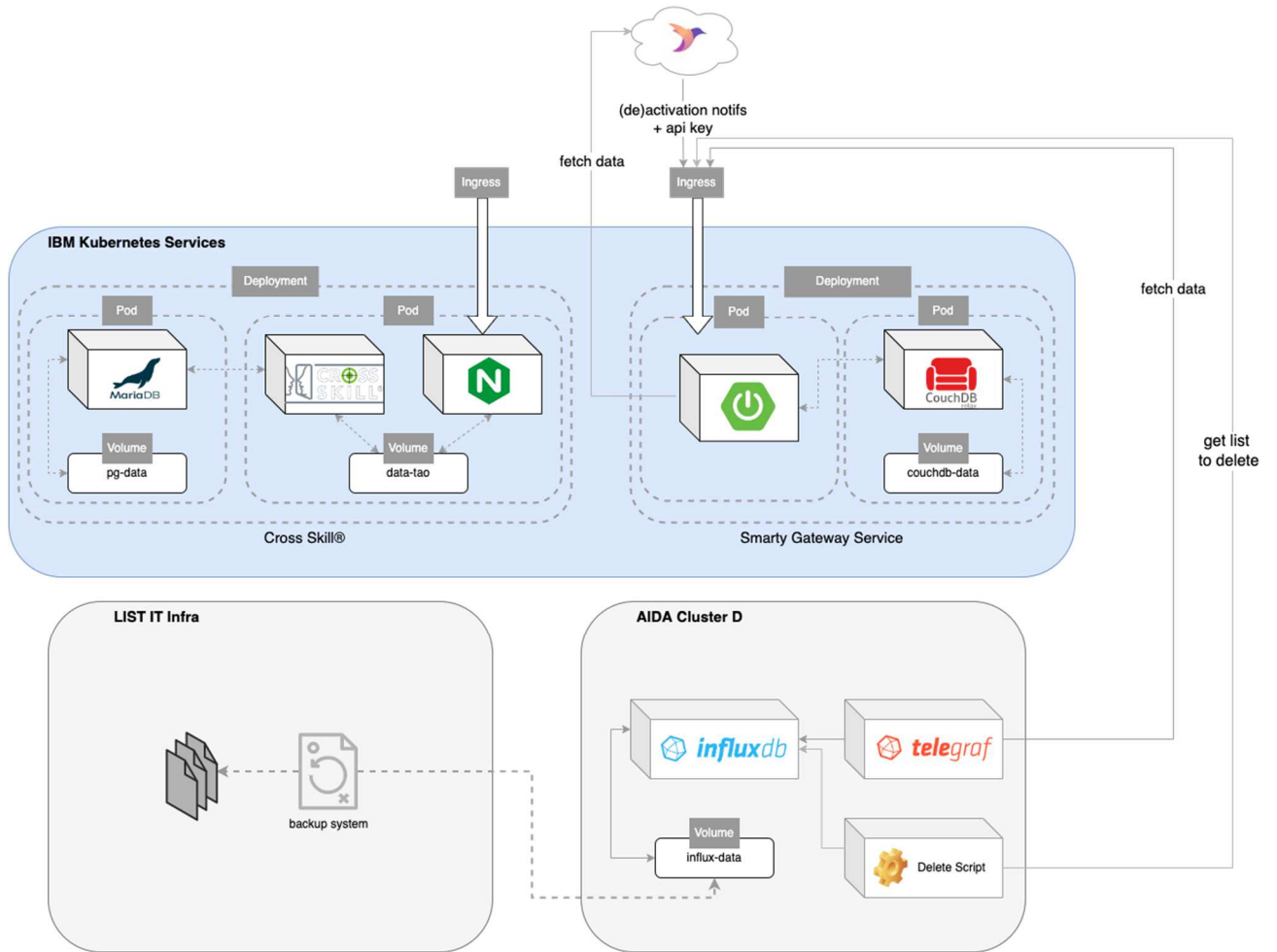


Figure 5 Energy Flexibility Survey Platform Architecture

## 2. Datasets

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### 2.1. General overview

This section serves as a deliverable for two deliverables: Deliverable 2.1.2 and Deliverable 2.2.1. It describes the dataset of anonymized user profiles collected in the frame of the FlexBeAn project user study number 1 about energy use and flexibility.

Each row represents the answers of a user, and the column provides some information related to different questions of the survey. The columns include the response date, the time spent answering, and the value provided for each question page i.e. for each survey section.

To ensure anonymization and enhance the usability of the dataset, certain columns were altered, removed, or added during the post-processing phase. To clean the dataset, some rows were also removed.

### 2.2. Dataset Access

In the frame of the FlexBeAn project, the dataset is intended for use by:

- CREOS team in its shared folder (access managed by LIST):

<https://flexbean-cloud.list.lu/index.php/f/34182>

- SnT team in its shared folder (access managed by LIST):

<https://flexbean-cloud.list.lu/index.php/f/34183>

### 2.3. Dataset Structure

- Format: CSV (.csv) with header
- Number of rows: 459
- Number of columns: 235

### 2.4. Data Dictionary

#### 2.4.1. Column identifier format

The format of each column is one of:

- A simple string without dot i.e. without ".": (example: uid) the column contains a value that applies to the entire user survey
- Two strings separated by ".0\_\_": (example: i\_bio.0\_\_date) the first part represents the question page i.e. the survey section and the second part an information on the section itself. The second part is either refers to the answer value with a name in

relation to a specific question, or to a field automatically added by the assessment tool (see the next section).

## 2.4.2. Generic section field dictionary

For each section, the fields automatically added are:

Table 1: Generic section field dictionary.

Second part	Description	Data Type	Possible Values	Example values
<b>date</b>	Section submission date	DateTime	Format: dd/MM/yyyy HH:mm:ss	"27/05/2023 15:05:46"
<b>date_ts</b>	Section submission Unix Timestamp	Integer	The number of milliseconds since January 1, 1970 (UTC)	"1688503483000"
<b>label</b>	Section technical label	String		"1. Biographical questions (EN) scoring"
<b>numAttempts</b>	Number of section attempts. Happens when the user has not answered some mandatory questions	Integer	Values greater than 0	"2"
<b>duration</b>	Time spent by the user on the section (in seconds)	Float	Values greater than 0,0	"334.201527"

## 2.4.3. Field dictionary

Table 2: Field dictionary.

Column name	Description	Data Type	Possible Values	Example values
<b>uid</b>	User Unique Identifier in the dataset	Integer		"6"
<b>testNbs</b>	Total number of surveys filled by the user	Integer	Values greater than 0	"2"
<b>testNb</b>	Number of the survey filled by the user	Integer	Values greater than 0 and lower or equal than testNbs value	"1"
<b>testIdentifier</b>	Identifier or the survey	String (URI)	Format: http://tests.flexbean.list.lu#survey1{audience}{lang} - audience: ["mail", "social"] - lang: survey language: ["en", "fr", "de"]	"http://tests.flexbean.list.lu#survey1mail en"
<b>totalDuration(s)</b>	Duration of the survey (in seconds)	Float	Values greater than 0,0	"1087,033041"
<b>totalDuration(min)</b>	Duration of the survey (in minutes)	Integer	Values greater than 0	"12"
<b>i_bio.0__bio_gender</b>	User gender	String (Enum)	"gender_woman" "gender_man" "gender_nonbinary"	"gender_woman"

			"gender_nodisclose" =prefer not to disclose	
<b>i_bio.0__bio_diploma</b>	Degree of education	String (Enum)	"diploma_no"=no diploma "diploma_midhighschool" "diploma_GED" "diploma_bachelor" "diploma_master" "diploma_doctoral"	"diploma_doctoral"
<b>i_bio.0__bio_job</b>	Job sector	String (Enum)	"job_healthcare" "job_education" "job_information_tech" "job_finance" "job_retail" "job_hospitality" "job_manufacturing" "job_transporation_logistic" "job_marketing_advert" "job_government_public_admin" "job_student" "job_unemployed" "job_other"	"job_education"
<b>i_bio.0__bio_job_timeable</b>	Current job timetable	String (Enum)	"bio_job_timeable_day" "bio_job_timeable_night" "bio_job_timeable_other"	"bio_job_timeable_night"
<b>i_bio.0__bio_income</b>	Household monthly net income range (other adults incomes combined) (in euros €)	String (Enum)	"income_0_1000" "income_1000_2999" " "income_3000_4999" " "income_5000_6999" " "income_7000_8999" " "income_9000" "income_nodisclose" "	"income_1000_2999"
<b>i_bio.0__bio_householdcomp</b>	Household composition	String (Enum)	"householdcomp_one"=one person "householdcomp_cp_l_wo_child"= couple without children "householdcomp_cp_l_w_child"=couple with child(ren) "householdcomp_single_parent" "householdcomp_adults"=multiple adults "householdcomp_nodisclose"	
<b>i_bio.0__bio_owner</b>	House(or apartment) owner or renter	String (Enum)	"bio_owner_owner" =owner	"bio_owner_owner"

			"bio_owner_renter" =renter	
<b>i_bio.0__bio_householdtype</b>	Household type	String (Enum)	"householdtype_apartment" "householdtype_detached" "householdtype_semidetached" "householdtype_row" "householdtype_other"	"householdtype_detached"
<b>i_bio.0__bio_householdtype_other</b>	Household type when other selected by user	String (free input)	Any String	"Caravan"
<b>i_bio.0__bio_city</b>	City of residence	String (Enum)	Listed in <a href="#">Appendix A</a>	"city_beaufort"
<b>i_bio.0__bio_smartmeter</b>	If user owns a Smarty+ dongle	String (Enum)	"smartmeter_yes" "smartmeter_no" "smartmeter_dontknow"=don't know what it is "smartmeter_plan2buy"=user plan to buy one	"smartmeter_yes"
<b>i_bio.0__bio_country</b>	Country or residence, for "social" survey only	String (Enum)	"bio_country_de"=Germany "bio_country_be"=Belgium "bio_country_fr"=France "bio_country_lu"=Luxembourg "bio_country_other"=other country	"bio_country_lu"
<b>i_bio.0__outcome__bio_age_final</b>	User age (in 5-year range)	String (Enum)	"15-19"=between 15 and 19 years old "20-24" "25-29" "30-34" "35-39" "40-44" "45-49" "50-54" "55-59" "60-64" "65-69" "70-74" "75-79" "80-84" "85-89" "90-94" "95-99"=between 95 and 99 years old and beyond	"35-39"
<b>i_usage.0__usage_smartycampaign</b>	Smarty+ campaign participation	String (Enum)	"usage_smartycampaign_no" "usage_smartycampaign_yes"	"usage_smartycampaign_yes"
<b>i_usage.0__usage_devices</b>	Devices regularly in use in the household	String (Enum List)	"usage_devices_washing"=Washing machine	"['usage_devices_washing';

			<p>“usage_devices_dryer”=Tumble dryer  “usage_devices_waterheater”=Electric water heater  “usage_devices_fridge”=Fridge  “usage_devices_deepfreezer”=Deep freezer  “usage_devices_dishwasher”=Dish washer</p>	'usage_devices_fridge']"
<b>i_usage.0__usage_heatsyst</b>	Main heating system	String (Enum)	<p>“heatsyst_oil”=Oil heating system  “heatsyst_gas”=Gas heating system  “heatsyst_elecheat”=Electric heat pump  “heatsyst_wood”=Wood pellets / Wood chips  “heatsyst_district”=District heating  “heatsyst_LPG”=Liquified petroleum gas (LPG)  “heatsyst_wood_stove”=Wood stove (as the main heating system, not in addition to the main heating system)  “heatsyst_elecconvection”=Electric convection heater  “heatsyst_dontknow”=I don't know  “heatsyst_other”=Other, please specify</p>	“heatsyst_gas”
<b>i_usage.0__usage_heatsyst_other</b>	Main heating system when other than listed	String (free input)	Any String	“No heating, house in Kenya.”
<b>i_usage.0__usage_ev</b>	User situation regarding Electric Vehicles	String (Enum)	<p>“usage_ev_yes”=has an EV  “usage_ev_no_but_3_years”=don't have an EV but plan to acquire one in the 3 next years  “usage_ev_no”=don't have an EV and don't plan to change the situation</p>	“usage_ev_yes”
<b>i_usage.0__usage_pv</b>	User situation regarding Photovoltaic installation	String (Enum)	<p>“usage_pv_yes_w_batt”=have a photovoltaic installation and a battery storage system connected to it</p>	“usage_pv_yes_w_batt”

			<p>“usage_pv_yes_wo_batt”=have a photovoltaic installation without battery storage system</p> <p>“usage_pv_no_but_3_years”=no photovoltaic installation but plan to acquire one in the 3 next years</p> <p>“usage_pv_no”=no photovoltaic installation and don’t plan to change the situation</p>	
<b>i_flex_intro_lit.0_literacy_highest_cons_period</b>	Period where the electricity consumption is the highest (in hours)	String (Enum)	<p>“highest_cons_23_03”=from 23h00 to 03h00</p> <p>“highest_cons_14_17”</p> <p>“highest_cons_17_20”</p> <p>“highest_cons_dont know”=user don’t know</p> <p>“highest_cons_dont understand”=user don’t understand the question</p>	“highest_cons_17_20”
<b>i_flex_noincent.0_flex_wash_none</b>	User use habitually the washing machine during the peak time i.e. 17h-20h (no incentive) (7-level likert scale)	Integer (Enum)	<p>“1”=Strongly disagree</p> <p>“2”</p> <p>“3”</p> <p>“4”</p> <p>“5”</p> <p>“6”</p> <p>“7”=Strongly agree</p>	“6”
<b>i_flex_noincent.0_flex_dryer_none</b>	User use habitually the tumble dryer during the peak time i.e. 17h-20h (no incentive) (7-level likert scale)	Integer (Enum)	<p>“1”=Strongly disagree</p> <p>“2”</p> <p>“3”</p> <p>“4”</p> <p>“5”</p> <p>“6”</p> <p>“7”=Strongly agree</p>	“5”
<b>i_flex_noincent.0_flex_dish_none</b>	User use habitually the dishwasher during the peak time i.e. 17h-20h (no incentive) (7-level likert scale)	Integer (Enum)	<p>“1”=Strongly disagree</p> <p>“2”</p> <p>“3”</p> <p>“4”</p> <p>“5”</p> <p>“6”</p> <p>“7”=Strongly agree</p>	“4”
<b>i_flex_noincent.0_flex_heatsyst_none</b>	Allow energy supplier to adapt user’s heating system during the peak time i.e. 17h-20h (no incentive)	Integer (Enum)	<p>“1”=Strongly disagree</p> <p>“2”</p> <p>“3”</p> <p>“4”</p> <p>“5”</p> <p>“6”</p>	“3”

	(7-level likert scale)		"7"=Strongly agree	
<b>i_flex_noincent.0_flex_car_none</b>	Allow energy supplier to slow down the charging of user's Electric Vehicle during the peak time i.e. 17h-20h (no incentive) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"2"
<b>i_flex_wash_low.0_RESPONSE</b>	User would not use the washing machine during the peak time i.e. 17h-20h to save 0,01 € per use (≈3€ per year) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"1"
<b>i_flex_wash_med.0_RESPONSE</b>	User would not use the washing machine during the peak time i.e. 17h-20h to save 0,09 € per use (≈25€ per year) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"2"
<b>i_flex_wash_high.0_RESPONSE</b>	User would not use the washing machine during the peak time i.e. 17h-20h to save 0,15 € per use (≈40€ per year) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"3"
<b>i_flex_dryer_low.0_RESPONSE</b>	User would not use the tumble dryer during the peak time i.e. 17h-20h to save 0,02 € per use (≈3€ per year) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"1"
<b>i_flex_dryer_med.0_RESPONSE</b>	User would not use the tumble dryer during the peak time i.e. 17h-20h to save 0,27 € per use (≈42€ per year) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"2"
<b>i_flex_dryer_high.0_RESPONSE</b>	User would not use the tumble dryer during the peak time i.e. 17h-20h to save 0,37 € per use (≈60€ per year) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"3"
<b>i_flex_dish_low.0_RESPONSE</b>	User would not use the dishwasher during the peak time i.e. 17h-20h to save	Integer (Enum)	"1"=Strongly disagree "2" "3"	"1"

	0,01 € per use (≈2,50€ per year) (7-level likert scale)		"4" "5" "6" "7"=Strongly agree	
<b>i_flex_dish_med.0__RESPONSE</b>	User would not use the dishwasher during the peak time i.e. 17h-20h to save 0,14 € per use (≈35€ per year) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"2"
<b>i_flex_dish_high.0__RESPONSE</b>	User would not use the dishwasher during the peak time i.e. 17h-20h to save 0,21 € per use (≈55€ per year) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"3"
<b>i_flex_heatsyst_low.0__RESPONSE</b>	Allow energy supplier to adapt user's heating system during the peak time i.e. 17h-20h to save ≈40€ per year (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"1"
<b>i_flex_heatsyst_med.0__RESPONSE</b>	Allow energy supplier to adapt user's heating system during the peak time i.e. 17h-20h to save ≈90€ per year (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"2"
<b>i_flex_heatsyst_high.0__RESPONSE</b>	Allow energy supplier to adapt user's heating system during the peak time i.e. 17h-20h to save ≈200€ per year (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"3"
<b>i_flex_car_low.0__RESPONSE</b>	Allow energy supplier to slow down the charging of user's Electric Vehicle during the peak time i.e. 17h-20h to save 0,20€ per use (≈25€ per year) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"1"
<b>i_flex_car_med.0__RESPONSE</b>	Allow energy supplier to slow down the charging of user's Electric Vehicle during the peak time i.e. 17h-20h to save 2,20 €	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"2"

	per use (≈250€ per year) (7-level likert scale)			
<b>i_flex_car_high.0__RESPONSE</b>	Allow energy supplier to slow down the charging of user's Electric Vehicle during the peak time i.e. 17h-20h to save 3,70 € per use (≈400€ per year) (7-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5" "6" "7"=Strongly agree	"3"
<b>i_epvq.0__epvq_treated_justly</b>	It is important to [him or her] that every person is treated justly (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_unity_w_nature</b>	It is important to [him or her] to be in unity with nature (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_have_auth_over_others</b>	It is important to [him or her] to have authority over others (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_equal_opportunities</b>	It is important to [him or her] that every person has equal opportunities (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_env_pollution</b>	It is important to [him or her] to prevent environmental pollution (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_be_ambitious</b>	It is important to [him or her] to work hard and be ambitious	Integer (Enum)	"1"=Not like me at all "2" "3"	"3"

	(7-level likert scale)		"4" "5" "6" "7"=Very much like me	
<b>i_epvq.0__epvq_be_influential</b>	It is important to [him or her] to be influential (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_things_enjoys</b>	It is important to [him or her] to do things [he/she] enjoys (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_protect_env</b>	It is important to [him or her] to protect the environment (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_respect_nature</b>	It is important to [him or her] to respect nature (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_have_fun</b>	It is important to [him or her] to have fun (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_no_conflict</b>	It is important to [him or her] that there is no war or conflict (7-level likert scale)	Integer (Enum)	"1"=Not like me at all "2" "3" "4" "5" "6" "7"=Very much like me	"3"
<b>i_epvq.0__epvq_have_possessions</b>	It is important to [him or her] to have money and possessions	Integer (Enum)	"1"=Not like me at all "2" "3"	"3"

	(7-level likert scale)		<p>"4"</p> <p>"5"</p> <p>"6"</p> <p>"7"=Very much like me</p>	
<b>i_epvq.0__epvq_attention_question</b>	Attention question, user has to tick "Very much like me" (7-level likert scale)	Integer (Enum)	<p>"1"=Not like me at all</p> <p>"2"</p> <p>"3"</p> <p>"4"</p> <p>"5"</p> <p>"6"</p> <p>"7"=Very much like me</p>	"7"
<b>i_epvq.0__epvq_control_others_actions</b>	It is important to [him or her] to have control over others' actions (7-level likert scale)	Integer (Enum)	<p>"1"=Not like me at all</p> <p>"2"</p> <p>"3"</p> <p>"4"</p> <p>"5"</p> <p>"6"</p> <p>"7"=Very much like me</p>	"3"
<b>i_epvq.0__epvq_helpful_to_others</b>	It is important to [him or her] to be helpful to others (7-level likert scale)	Integer (Enum)	<p>"1"=Not like me at all</p> <p>"2"</p> <p>"3"</p> <p>"4"</p> <p>"5"</p> <p>"6"</p> <p>"7"=Very much like me</p>	"3"
<b>i_epvq.0__epvq_enjoy_life_pleasures</b>	It is important to [him or her] to enjoy the life's pleasures (7-level likert scale)	Integer (Enum)	<p>"1"=Not like me at all</p> <p>"2"</p> <p>"3"</p> <p>"4"</p> <p>"5"</p> <p>"6"</p> <p>"7"=Very much like me</p>	"3"
<b>i_epvq.0__epvq_care_worse_off</b>	It is important to [him or her] to take care of those who are worse off (7-level likert scale)	Integer (Enum)	<p>"1"=Not like me at all</p> <p>"2"</p> <p>"3"</p> <p>"4"</p> <p>"5"</p> <p>"6"</p> <p>"7"=Very much like me</p>	"3"
<b>i_bfi.0__bfi_reserved</b>	I see myself as someone who is reserved (5-level likert scale)	Integer (Enum)	<p>"1"=Strongly disagree</p> <p>"2"</p> <p>"3"</p> <p>"4"</p> <p>"5"=Strongly agree</p>	"2"
<b>i_bfi.0__bfi_trusting</b>	I see myself as someone who is generally trusting (5-level likert scale)	Integer (Enum)	<p>"1"=Strongly disagree</p> <p>"2"</p> <p>"3"</p> <p>"4"</p> <p>"5"=Strongly agree</p>	"2"

<b>i_bfi.0__bfi_lazy</b>	I see myself as someone who tends to be lazy  (5-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5"=Strongly agree	"2"
<b>i_bfi.0__bfi_relaxed</b>	I see myself as someone who is relaxed, handles stress well  (5-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5"=Strongly agree	"2"
<b>i_bfi.0__bfi_artistic_interests</b>	I see myself as someone who has few artistic interests  (5-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5"=Strongly agree	"2"
<b>i_bfi.0__bfi_outgoing</b>	I see myself as someone who is outgoing, sociable  (5-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5"=Strongly agree	"2"
<b>i_bfi.0__bfi_find_fault_w_others</b>	I see myself as someone who tends to find fault with others  (5-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5"=Strongly agree	"2"
<b>i_bfi.0__bfi_thorough_job</b>	I see myself as someone who does a thorough job  (5-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5"=Strongly agree	"2"
<b>i_bfi.0__bfi_nervous</b>	I see myself as someone who gets nervous easily  (5-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5"=Strongly agree	"2"
<b>i_bfi.0__bfi_active_imagination</b>	I see myself as someone who has an active imagination  (5-level likert scale)	Integer (Enum)	"1"=Strongly disagree "2" "3" "4" "5"=Strongly agree	"2"
<b>i_ati.0__ati_occupy_details</b>	I like to occupy myself in greater detail with technical systems  (6-level likert scale)	Integer (Enum)	"1"=Completely disagree "2" "3" "4" "5" "6"=Completely agree	"5"
<b>i_ati.0__ati_test</b>	I like testing the functions of new technical systems  (6-level likert scale)	Integer (Enum)	"1"=Completely disagree "2" "3" "4" "5"	"5"

			"6"=Completely agree	
<b>i_ati.0__ati_deal_w_techsyst</b>	I predominantly deal with technical systems because I have to  (6-level likert scale)	Integer (Enum)	"1"=Completely disagree "2" "3" "4" "5" "6"=Completely agree	"5"
<b>i_ati.0__ati_new_techsyst_intensively</b>	When I have a new technical system in front of me, I try it out intensively  (6-level likert scale)	Integer (Enum)	"1"=Completely disagree "2" "3" "4" "5" "6"=Completely agree	"5"
<b>i_ati.0__ati_spending_time_acquainted</b>	I enjoy spending time becoming acquainted with a new technical system  (6-level likert scale)	Integer (Enum)	"1"=Completely disagree "2" "3" "4" "5" "6"=Completely agree	"5"
<b>i_ati.0__ati_techsyst_works_enough</b>	It is enough for me that a technical system works; I don't care how or why  (6-level likert scale)	Integer (Enum)	"1"=Completely disagree "2" "3" "4" "5" "6"=Completely agree	"5"
<b>i_ati.0__ati_try2understand_how_works</b>	I try to understand how a technical system exactly works  (6-level likert scale)	Integer (Enum)	"1"=Completely disagree "2" "3" "4" "5" "6"=Completely agree	"5"
<b>i_ati.0__ati_basic_functions_enough</b>	It is enough for me to know the basic functions of a technical system  (6-level likert scale)	Integer (Enum)	"1"=Completely disagree "2" "3" "4" "5" "6"=Completely agree	"5"
<b>i_ati.0__ati_use_full_capabilities</b>	I try to make full use of the capabilities of a technical system  (6-level likert scale)	Integer (Enum)	"1"=Completely disagree "2" "3" "4" "5" "6"=Completely agree	"5"
<b>i_literacy.0__literacy_impact_increase_cons</b>	What is the impact if you largely increase your consumption during peak consumption hours	String (Enum)	"impact_cons_noimpact"=There is no impact "impact_cons_grid_stress"=Increased	"impact_cons_noimpact"

	(e.g. by charging your Electric Vehicle)		stress on the electricity grid "impact_cons_grid_expansion"=Provoking the necessity for electricity expansion works in the electricity grid "impact_cons_batt_life_impact"=A shorter battery life time as batteries of smartphones, laptops or Electric Vehicles heat up more if charged during peak consumption hours "impact_cons_dontknow"=I don't know "impact_cons_dontunderstand"=I don't understand the question	
<b>i_literacy.0__literacy_benefits_low_period</b>	What are the benefits of shifting your consumption from peak hours to a time of day where the consumption is lower	String (Enum)	"literacy_benefits_faster_charge"=Charging an electric vehicle, smartphone or laptop is faster "literacy_benefits_lower_bill"=To have a lower electricity bill due to lower grid expansion costs "literacy_benefits_no_benefits"=There is no benefit for the household consumer "literacy_benefits_less_co2"=Generally lower CO2 emissions because fewer gas power plants need to be deployed "literacy_benefits_dontknow"=I don't know "literacy_benefits_dontunderstand"=I don't understand the question	"literacy_benefits_faster_charge"
<b>i_literacy.0__literacy_pv_grid_mgmt</b>	Assuming there are a lot of Photovoltaic - PV (solar) installations in your neighbourhood. Are there any benefits of shifting your consumption from peak hours to a sunny time of day	String (Enum)	"pv_grid_mgmt_yes"=Yes, it is important to consume the electricity when and where it is produced to prevent grid congestions "pv_grid_mgmt_yes_loss"=Yes, otherwise the electricity is lost as	"pv_grid_mgmt_yes"

			<p>soon as it enters the grid</p> <p>"pv_grid_mgmt_no_store"=No, we can easily store all excess energy in summer and use it in winter</p> <p>"pv_grid_mgmt_no_transport"=No, the electricity can easily be transported over long distances, so it can be consumed elsewhere</p> <p>"pv_grid_mgmt_no_sunny"=No, there is not a lot of electricity production during sunny weather</p> <p>"pv_grid_mgmt_dontknow"=I don't know</p> <p>"pv_grid_mgmt_dontunderstand"=I don't understand the question</p>	
<b>i_literacy.0__literacy_delay_dishwasher</b>	Do you know how to delay the start of your dishwasher	String (Enum)	<p>"delay_dishwasher_yes"=Yes</p> <p>"delay_dishwasher_no"=No</p> <p>"delay_dishwasher_nofeature"=It does not have this function</p> <p>"delay_dishwasher_nodishwasher"=I don't have a dishwasher</p> <p>"delay_dishwasher_dontunderstand"=I don't understand the question</p>	"delay_dishwasher_yes"
<b>i_literacy.0__literacy_delay_car</b>	Do you know how to delay the start of your Electric Vehicle charging	String (Enum)	<p>"delay_car_yes"=Yes</p> <p>"delay_car_no"=No</p> <p>"delay_car_nofeature"=It does not have this function</p> <p>"delay_car_no_ev"=I don't have an Electric Vehicle</p> <p>"delay_car_dontunderstand"=I don't understand the question</p>	"delay_car_yes"
<b>i_literacy.0__literacy_100_renewable_elec</b>	What challenges does the switch to 100% renewable electricity generation entail	String (Enum)	<p>"lit_100renew_volatile"=Renewable energy generation is highly volatile (changes constantly)</p> <p>"lit_100renew_decentralized"=Renewabl</p>	"lit_100renew_volatile"

			<p>e energy generation is decentralized (a lot of small production plants instead of few large ones)</p> <p>"lit_100renew_storage"=Difficult to store renewable energy</p> <p>"lit_100renew_align_prod"=Difficult to align generation and consumption</p> <p>"lit_100renew_dontknow"=I don't know</p> <p>"lit_100renew_dontunderstand"=I don't understand the question</p>	
<b>i_literacy.0__literacy_attention_question</b>	This is an attention question, please tick "Yes"	String (Enum)	<p>"lit_attention_question_yes"=Yes</p> <p>"lit_attention_question_no"=No</p> <p>"lit_attention_question_dontknow"=I don't know</p>	"lit_attention_question_yes"
<b>i_literacy.0__literacy_rank_devices</b>	On average, when a device works for one hour, rank them from the highest (up) consumption to the lowest (below) consumption	String (Ordered Enum List)	<p>"rank_devices_dishwasher"=Dishwasher / laundry</p> <p>"rank_devices_dryer"=Tumble dryer</p> <p>"rank_devices_bulbs"=5 light bulbs, each at 10 W</p> <p>"rank_devices_car"=Electric Vehicle</p> <p>"rank_devices_tv"=TV and music player</p> <p>"rank_devices_heat_pump"=Heat pump</p>	<pre>&lt;'rank_devices_car' ; 'rank_devices_dryer' ; 'rank_devices_dishwasher'; 'rank_devices_heat_pump'; 'rank_devices_tv'; 'rank_devices_bulbs' &gt;</pre>
<b>i_literacy.0__literacy_car_charge_fully</b>	How much electricity does it take to fully charge an electric vehicle	String (Enum)	<p>"car_charge_fully_0_1"=0.3 - 1 kWh</p> <p>"car_charge_fully_1_30"=1 - 30 kWh</p> <p>"car_charge_fully_30_100"=30 - 100 kWh</p> <p>"car_charge_fully_100_300"=100 - 300 kWh</p> <p>"car_charge_fully_300_1000"=300 - 1000 kWh</p> <p>"car_charge_fully_dontknow"=I don't know</p> <p>"car_charge_fully_dontunderstand"=I don't understand the question</p>	"car_charge_fully_0_1"
<b>i_literacy.0__literacy_bill</b>	Do you know the amount of your	String (Enum)	<p>"bill_no"=no</p> <p>"bill_yes"=Yes, I pay approximatively:</p>	"bill_no"

	monthly electricity bill			
<b>i_literacy.0__literacy_bill_amount</b>	I pay approximately: (in €/month)	Integer (free input)	Values greater or equal than 0	"110"
<b>i_literacy.0__literacy_heatsyst_preferred</b>	Which heating system would you prefer for your home, considering both have a 15-year lifespan	String (Enum)	"heatsyst_preferred_a"=Model A with a retail price of €3750 and a monthly bill of €100 "heatsyst_preferred_b"=Model B with a retail price of €5000 and a lower monthly bill of €80 "heatsyst_preferred_equal"=I have no preference, both models are equally adequate "heatsyst_preferred_dontknow"=I don't know "heatsyst_preferred_dontunderstand"=I don't understand the question	"heatsyst_preferred_a"
<b>i_literacy.0__literacy_fridge_energy</b>	Which of these household appliances uses the most electric energy during one day (cf. <a href="#">Appendix B</a> )	String (Enum)	"fridge_energy_fridge"=fridge/freezer "fridge_energy_stove"=stove/oven "fridge_energy_dontknow"=I don't know "fridge_energy_dontunderstand"=I don't understand the question	"fridge_energy_fridge"=
<b>i_literacy.0__literacy_fridge_power</b>	Which of these household appliances uses the most electric energy during one day (cf. <a href="#">Appendix B</a> )	String (Enum)	"fridge_power_fridge"=fridge/freezer "fridge_power_stove"=stove/oven "fridge_power_dontknow"=I don't know "fridge_power_dontunderstand"=I don't understand the question	"fridge_power_stove"=
<b>mail-consent.0__mail_consent_study</b>	I'm interested to participate in future phases of the FlexBeAn project and agree to be contacted via email	String (Enum)	"mail_consent_study_yes" "mail_consent_study_no"	"mail_consent_study_yes"
<b>mail-consent.0__mail_consent_voucher</b>	I want to receive the 20€ voucher	String (Enum)	"mail_consent_voucher_yes" "mail_consent_voucher_no"	"mail_consent_voucher_yes"
<b>clusterNb</b>	Cluster number the use belongs to	Integer (Enum)	"1"=cluster 1 "2"=cluster 2	"1"

## 2.5. Data Collection Methodology

The data were collected through an online survey between May 12, 2023, and August 13, 2023, through the energy literacy assessment platform that is using the e-Testing platform TAO, community edition version.

Participants were recruited through two different methods: one involving the offer of a voucher as an incentive, and another without any such incentive.

The participants with voucher incentive were recruited via email through random sampling among CREOS customers.

Each question page included a date field, a duration field and response fields, automatically recorded by the survey system.

## 2.6. Data Processing

### 2.6.1. JSON to row

The e-Testing platform TAO provides an API to retrieve each user answers as a JSON file.

Each JSON data was flattened to a single row.

### 2.6.2. Filtering

Some user results were removed based on:

- Incomplete data, i.e. missing data, due to unknown bug in the assessment tool.
- Answer to the attention question in the energy literacy section of the survey.

### 2.6.3. Added column

- **clusterNb**: the ID of the cluster to which the user is assigned (related to the Deliverable 2.2.1).
- **totalDuration(min)**: based on the **totalDuration(s)** column, transformation from seconds to minutes.

### 2.6.4. Removed column

- **i\_bio.0\_\_bio\_age**: the age as string was removed as it is redundant with the **i\_bio.0\_\_outcome\_\_bio\_age\_final** which is a integer.
- **i\_usage.0\_\_usage\_smartycampaign\_mail**: (*anonymization*) the user mail used to participate to the smarty campaign.
- **mail-consent.0\_\_mail**: (*anonymization*) the user mail provided to receive a voucher (when relevant) and/or participate to subsequent phases of the study.

### 2.6.5. Transformed column

- **uid**: (anonymization) the Unique Identifier of the user in the energy literacy assessment platform was replaced by a Unique Identifier dedicated to the anonymized dataset. It is not a simple counter of rows in the dataset as a same user can have answered several times the survey (see **testNbs** and **testNb** column).
- **i\_bio.0\_\_outcome\_\_bio\_age\_final**: (*anonymization*) the age as integer was replaced by a string representing a 5-year range (*anonymization*).

### 3. Useful Links

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The FlexBeAn website:

<https://www.flexbean.lu/>

The energy literacy assessment platform is available at the following address:

<https://households.flexbean.lu>

The e-Testing platform TAO:

<https://taotesting.com/>

For any questions regarding the legal aspects of the dataset, please contact the LIST Data Protection Officer:

<mailto:dpo@list.lu>

## 4. Appendices

### 4.1. Appendix A - Possible values for i\_bio.0\_\_bio\_city

Table 3: List of the 102 Luxembourgish communes (May 2023).

Possible value	City name
"city_beaufort"	Beaufort
"city_bech"	Bech
"city_beckerich"	Beckerich
"city_berdorf"	Berdorf
"city_bertrange"	Bertrange
"city_bettembourg"	Bettembourg
"city_bettendorf"	Bettendorf
"city_betzdorf"	Betzdorf
"city_bissen"	Bissen
"city_biwier"	Biwer
"city_boulaide"	Boulaide
"city_bourscheid"	Bourscheid
"city_bous"	Bous
"city_clervaux"	Clervaux
"city_colmarberg"	Colmar-Berg
"city_consdorf"	Consdorf
"city_contern"	Contern
"city_dalheim"	Dalheim
"city_diekirch"	Diekirch
"city_differdange"	Differdange
"city_dippach"	Dippach
"city_dudelange"	Dudelange
"city_echternach"	Echternach
"city_ell"	Ell
"city_erpeldangesursre"	Erpeldange-sur-Sûre
"city_eschsuralzette"	Esch-sur-Alzette
"city_eschsursre"	Esch-sur-Sûre
"city_ettelbruck"	Ettelbruck
"city_feulen"	Feulen
"city_fischbach"	Fischbach
"city_flaxweiler"	Flaxweiler
"city_frisange"	Frisange
"city_garnich"	Garnich
"city_goesdorf"	Goesdorf
"city_grevenmacher"	Grevenmacher
"city_grosbous"	Grosbous
"city_habscht"	Habscht
"city_heffingen"	Heffingen
"city_helperknapp"	Helperknapp
"city_hesperange"	Hesperange
"city_junglinster"	Junglinster
"city_kerjeng"	Käerjeng
"city_kayl"	Kayl
"city_kehlen"	Kehlen
"city_kiischpelt"	Kiischpelt
"city_koerich"	Koerich
"city_kopstal"	Kopstal
"city_lacdelahauteresre"	Lac de la Haute-Sûre
"city_larochette"	Larochette
"city_lenningen"	Lenningen
"city_leudelange"	Leudelange
"city_lintgen"	Lintgen

"city_lorenzweiler"	Lorentzweiler
"city_luxembourg"	Luxembourg
"city_mamer"	Mamer
"city_manternach"	Manternach
"city_mersch"	Mersch
"city_mertert"	Mertert
"city_mertzig"	Mertzig
"city_mondercange"	Mondercange
"city_mondorflesbains"	Mondorf-les-Bains
"city_niederanven"	Niederanven
"city_nommern"	Nommern
"city_parchosingen"	Parc Hosingen
"city_ptange"	Pétange
"city_prizerdaul"	Préizerdaul
"city_putscheid"	Putscheid
"city_rambrouch"	Rambrouch
"city_reckangesurmess"	Reckange-sur-Mess
"city_redangesurattert"	Redange-sur-Attert
"city_reisdorf"	Reisdorf
"city_remich"	Remich
"city_roeser"	Roeser
"city_rosportmompach"	Rosport - Mompach
"city_rumelange"	Rumelange
"city_saeul"	Saeul
"city_sandweiler"	Sandweiler
"city_sanem"	Sanem
"city_schengen"	Schengen
"city_schieren"	Schieren
"city_schifflange"	Schifflange
"city_schuttrange"	Schuttrange
"city_stadtbredimus"	Stadtbredimus
"city_steinfort"	Steinfort
"city_steinsel"	Steinsel
"city_strassen"	Strassen
"city_tandel"	Tandel
"city_troisvierges"	Troisvierges
"city_useldange"	Useldange
"city_valledelernz"	Vallée de l'Ernz
"city_vianden"	Vianden
"city_vichten"	Vichten
"city_wahl"	Wahl
"city_waldbillig"	Waldbillig
"city_waldbredimus"	Waldbredimus
"city_walferdange"	Walferdange
"city_weilerlatour"	Weiler-la-Tour
"city_weiswampach"	Weiswampach
"city_wiltz"	Wiltz
"city_wincrange"	Wincrange
"city_winseler"	Winseler
"city_wormeldange"	Wormeldange

## 4.2. Appendix B - Literacy image fridge vs oven consumption



Figure 6 Literacy image - fridge vs oven consumption