NUDGE

Methodology to assess the impacts of behavioural changes from pilots

STREAMSAVE dialogue meeting

May 11 2022

NUDGE

Nudging consumers
towards energy efficiency
through behavioural science

NUDging consumers towards enerGy Efficiency through behavioral science

H2020 EU Research Project

Stratos Keranidis, PhD
R&D Director - domX home-IoT technologies
stratos@domx.io

domx

Challenges and Aim

- In the energy domain, **behavioral interventions** have already been considered as a means to improve the energy-related behavior of end users

- However, the potential of **nudging techniques** for energy efficiency has not yet been extensively investigated, mainly to the 5 following limitations that have been typically followed in the application of behavior interventions:
  - are not tailored to the specific psychological or contextual features of individual consumers
  - tend to be behaviorally informed rather than behaviorally tested through real trials
  - are not complemented or compared with traditional incentive schemes (e.g., discounts)
  - do not follow a solid methodology for statistically assessing the results out of trials
  - are not linked with policy making actions

- The NUDGE consortium has identified the aforementioned application gaps as an opportunity that defines the main project aim:

NUDGE aspires to systematically assess and fully unleash the potential of behavioral interventions towards achieving higher energy efficiency, paving the way to the generalized use of such interventions as a worthy addition to the policy-making toolbox

Objectives

OBJ2: Execute extensive field trials that address multiple instances of consumer behavior, implementing different mixes of behavior-based and traditional interventions

OBJ3: Develop a systematic research protocol to continuously measure the impact of the implemented behavioral interventions

OBJ1: Tailor the design of behavioral interventions to individual psychological and contextual variables, by leveraging digital platforms, energy data and data analytics

OBJ4: Consolidate the findings of pilots into recommendations reaching out to policy makers and relevant stakeholders

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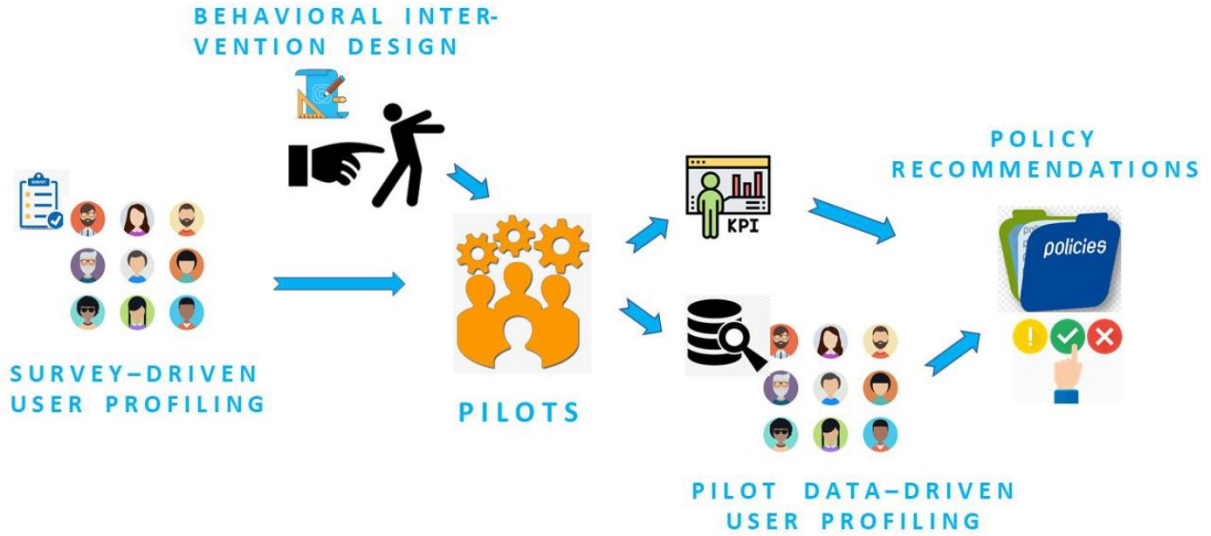
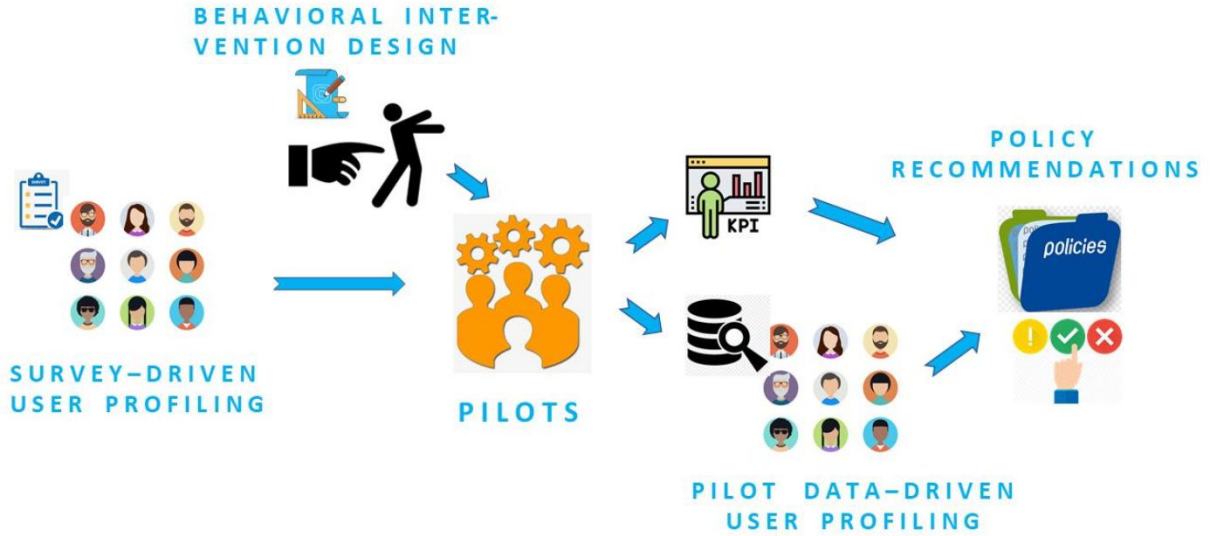
Methodology (1/2)



- **<u>Pre-pilot phase mechanisms and tools:</u>**
  - Install energy monitoring and management tools (eg. smart meters, thermostats)
  - Employ digital user interfaces (eg. mobile applications, dashboards) to enable energy consumers to actively monitor and efficiently manage energy flows
  - Deploy a central pilot data platform to automate the collection and monitoring of pilot data

Methodology (2/2)



- **<u>Pilot phase mechanisms and tools:</u>**
  - Time phasing of multiple interventions within and across pilots
    - Pre-interventions phase (M10-M14)
    - Testing phase (M15-M32) - 3 behavioral interventions per pilot
    - Post-interventions phase (M33-M36)
  - Automated monitoring of responses and adoption of tested interventions
  - Automatic calculation of pilot KPIs for performance comparison within a pilot and across pilots
  - Evaluation of behaviour change across tested interventions and consumer profiles

Pilots

- Five heterogeneous pilots have been carefully planned to experiment with consumers:
  - in five different EU states (Greece, Belgium, Germany, Portugal and Croatia)
  - in different environments (residential, energy communities, schools)
  - belonging to different age groups (young children as well)
  - and income classes (low, medium, high)
  - being served by different energy carriers (electricity, natural gas)
  - including residential prosumers and EV drivers,

  on top of which we apply a broad set of behavioral interventions.

Interdisciplinary project-based education on home energy consumption for children in Belgium

Optimization of EV charging with self-produced PV power in Germany

Healthy homes for long-lasting energy efficiency behavior in Portugal

Efficient control of heating and DHW preparation for Natural Gas boilers in Greece

Promoting distributed self-production for local Energy communities in Croatia

Data collection in the different pilots

Greece - data collection pipeline

Legacy Natural Gas boilers

domX Smart Heating Controller

Home Router

domX data collection platform (Greece)

common data reporting API

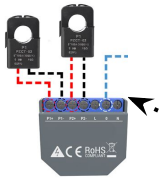
NUDGE central platform

User interface API

domX app

Portugal - data collection pipeline

Electrical board



Power meters

Wi Fi

IAQ sensors

Home Router

WWW

INEGI data collection platform (Portugal)

API

common data reporting API

NUDGE Central Platform

API

User interface API

INEGI app

NUDGE central data collection Platform

NUDGE central data collection Platform

domx

inegi

Zelena Energetska Zadruga

beegy

Spring-Stof

5 pilot platforms

API

automated data reporting API

NUDGE central platform

automated analytics/ KPI calculation

Reported metrics:

1. home consumption
2. home production
3. indoor/outdoor temp/hum
4. CO2 emissions
5. users employing the intervention

KPIs:

1. consumption reduction
2. self-consumption increase
3. indoor air quality increase
4. CO2 emission reduction
5. user adoption rate

NUDGE common data Schema

domx

inegi

Zelena Energetska Zadruga

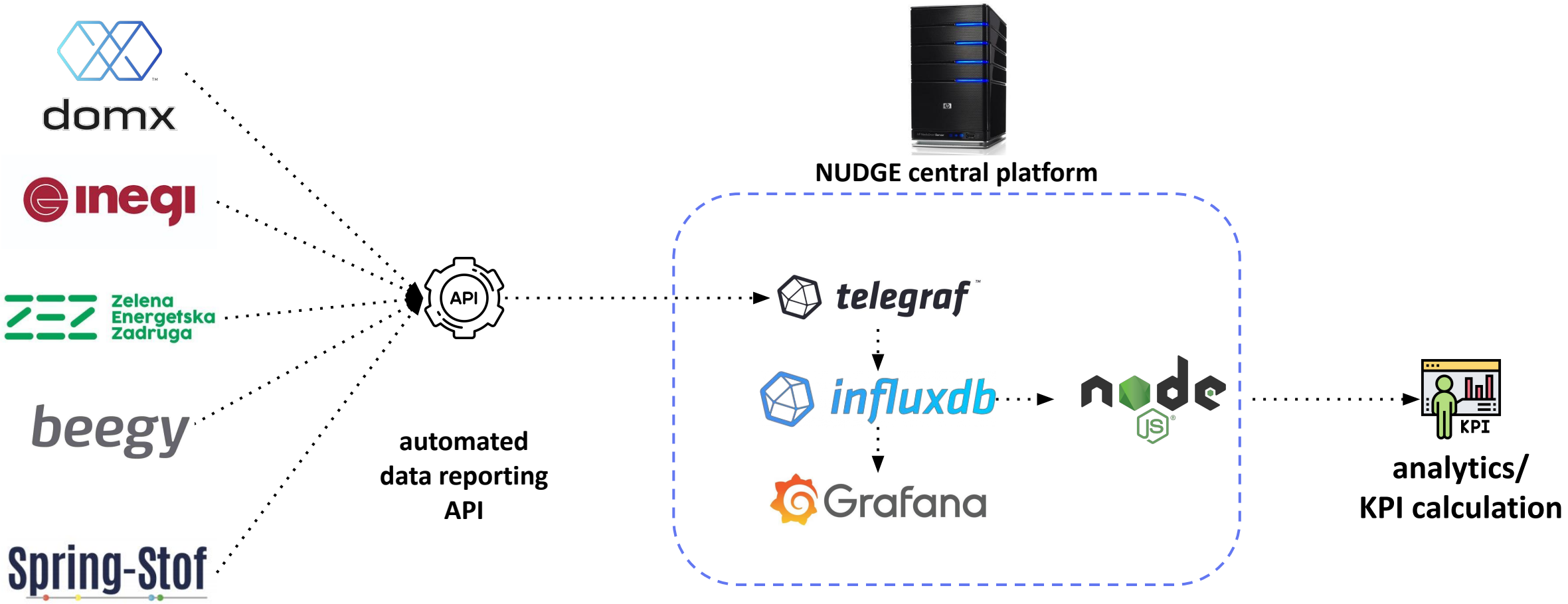
beegy

Spring-Stof

5 pilot platforms

ID	Metric	DOMX	BEEGY	ZEZ	SSTOF	INEGI
1	InstEnergyIn	X				
2	InstEnergyOut					
3	EnergyIn	X	X	X	X	X
4	EnergyOut		X	X	X	
5	PowerIn		X	X	X	X
6	PowerOut		X	X	X	
7	ReactivePower			X		X
8	Voltage			X		X
9	Current			X		X
10	Pf			X		X
11	PowerOutToBattery		X			
12	EnergyOutToBattery		X			
13	PowerInFromBattery		X			
14	EnergyInFromBattery		X			
15	Modulation	X				
16	TempIndoor	X				
17	TempTarget	X				X
18	TempOutdoor	X				
19	HumIndoor	X				X
20	HeatingBalance	X				
21	CO2Indoor					X
22	PM2_5					X
23	PM10					X
24	BarPressure					X
25	VOC					X
26	BoilerHeat	X				
27	BoilerWater	X				
28	HeatRequest	X				
29	OTCMaxT	X				
30	BoilerT	X				

NUDGE central data collection Platform



Pilot monitoring dashboards - Greece

Pilot monitoring dashboards - Portugal

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