Integrated Retrofit Design Methodology

The objective of the **integrated retrofit design methodology (IDM)** is guide all involved stakeholders in the value chain of neighbourhood retrofitting projects in **finding the most effective energy retrofitting solutions in neighbourhood retrofitting projects**, with regard to energy and cost efficiency and their overall sustainability performance. IDM is intended to **support the involved stakeholders** throughout the project life cycle from the early initiation and concept phases to the implementation and post occupancy phase of the project in a structured and systematic manner that considers the required communication and participation mechanisms between all involved stakeholders. NewTREND IDM organizes the **retrofitting project based on novel approach** that divides the retrofitting project into **10 phases**:

1. **Initiation phase:** determining the project scope and mode
2. **Preparation phase:** collection of relevant data at building and neighbourhood level
3. **Diagnoses phase:** analysing the neighbourhood status quo
4. **Strategic definition phase :** setting the project targets
5. **Concept phase:** Developing retrofitting concepts
6. **Decision making phase :** choosing a retrofitting concept to be implemented
7. **Design development and tendering phase :** developing the working drawing and construction doc
8. **Construction phase :** realizing the project
9. **Handover and close out phase:** handing over the project to the end user
10. **In-use phase:** monitoring and improving the realized project performance

Three mode approach

Retrofitting existing buildings and neighbourhoods pose a far greater challenge in terms of data acquisition, the extensivity of the acquired data and its accuracy, thus its reliability. To overcome this challenge, NewTREND offers its users the possibility to operate in three different modes of operation namely; **Basic, Advanced and Premium.** The main difference between the three modes lies in the nature of the data and on the level at which the data is collected.

	BASIC	ADVANCED	PREMIUM
Geometry	2D Model	BIM Model	BIM Model
Data level	Storey	Room	Room
Data input	Default / User input	Default / User input	User input / Automated
Data source	Simulated / Default	Simulated / Default	Real values
Scale	Building/ Neighborhood	Building	Building
Scope	Energy	Energy and Comfort	Energy and Comfort

NewTREND KPIs

NewTREND
Key Performance Indicators
are a set of metrics designed to help decision makers to assess the current status of the neighbourhood at single building level, evaluating the impact of various retrofitting solutions on the overall sustainability performance.

DISTRICT CORE SET KPIs

Environment
D.1 - ENERGY
D.1.1 Operational Primary Energy Demand
D.1.2 Delivered Energy Demand
D.1.3 Renewable Energy on Site
D.2- IMPACTS
D.2.1 Global Warming Potential

Society
D.8 ACOUSTIC COMFORT
D.8.1 Acoustic Environment

Economy
D.10 OPERATIONAL COSTS
D.10.1 Operational Energy Costs

BUILDING CORE SET KPI

Environment
B.1 - ENERGY
B.1.1 Operational Primary Energy Demand
B.1.2 Delivered Energy Demand
B.1.3 Renewable Energy on Site
B.2 - IMPACTS
B.2.1 Global Warming Potential

Society
B.5 - AIR QUALITY
B.5.1 Indoor Air Quality
B.6 THERMAL COMFORT
B.6.1 Summer Comfort without Cooling
B.6.2 Thermal Comfort in the Heating Season
B.6.3 Thermal Comfort in the Cooling Season
B.8 ACOUSTIC COMFORT
B.8.1 Acoustic Comfort

Economy
B.10 OPERATIONAL COSTS
B.10.1 Operational Energy Costs

IES — iesve.com
ABUD — www.abud.hu
iiSBE Italia R&D — www.iisbe-rd.it
Regenera Levante — regeneralevante.com
University College Dublin — www.ucd.ie
Granlund Oy Granlund — www.granlund.fi/en
JER dr. jakob energy research — www.drjakobenergyresearch.de
UNIVPM — www.univpm.it
STAM — www.stamtech.com
University College Cork — www.ucc.ie/en/cppu
LBS London Business School — www.london.edu
MUAS University of Applied Sciences Munich — www.hm.edu/en
SantCugat Ajuntament de SantCugat — www.santcugat.cat

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement n. 680474.

NewTREND

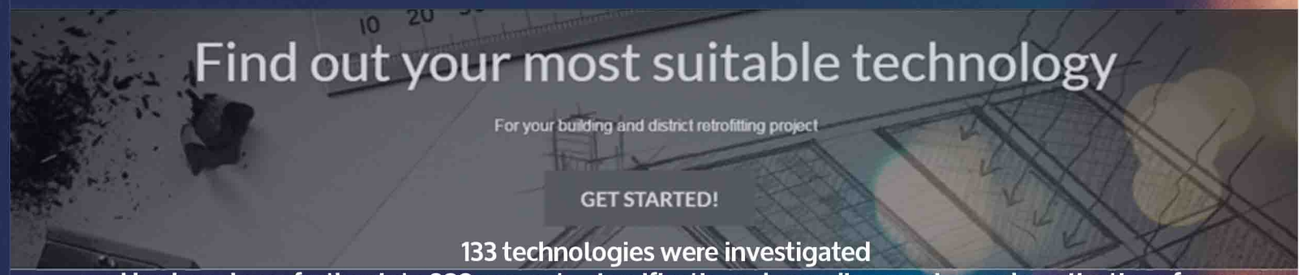
NEW Integrated Methodology and **T**ools for **R**etrofit Design Towards a Next Generation of **EN**ergy Efficient and Sustainable Buildings and **D**istricts

13 partners · **7** countries · **3** demo sites · **36** months

NewTREND Technology Library

The NewTREND technology Library includes all the information related to available **RETROFIT TECHNOLOGIES** at building and district level. The Library features **filtering functionalities** to allow then user to select the most appropriate solution based on:

- Project Budget: total budget available for the intervention
- Type of Building: through a drop-down list the building type can be selected
- Gross floor area of the building, in m^2
- Climate Area
- Information regarding the required power of the system
- Desired Scale of application, whether it is building or district
- Ease of Application, on a 1-5 scale
- Category of Interventions



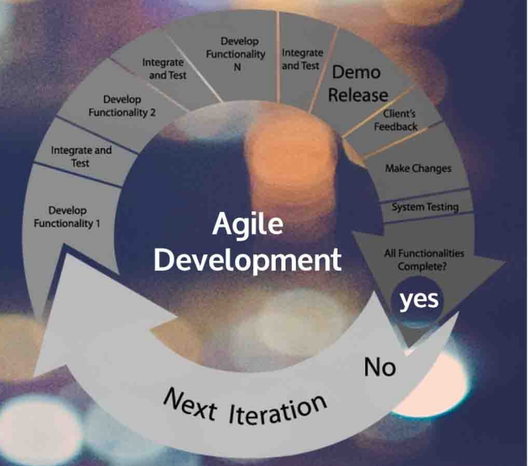
133 technologies were investigated
and broken down further into 289 separate classifications depending on size and applications for use

1 See successful case studies
2 Analysis of New Technologies
3 Technology library

External thermal insulation composite system
Scale of intervention: Building
Cathegory: Building envelope_Outer wall
Climate zones: All
Easy of application: 3
Investment cost: 50 euro /ext wall m^2

Double Skin Facade
Scale of intervention: Building
Cathegory: Building envelope_Outer wall
Climate zones: All
Easy of application: 4
Investment cost: 600 euro /ext wall m^2

Cavity wall insulation (injection)
Scale of intervention: Building
Cathegory: Building envelope_Outer wall
Climate zones: All
Easy of application: 3
Investment cost: 25 euro /ext wall m^2



Finnish Pilot Project: Seinäjoki, Finland

Location: City of Seinäjoki, Finland.
General Information: Pilot site is consisted of 4 buildings, built mostly in 1920s, area used to serve as a hospital, while nowadays their usage is multifunctional. Main building is used by vocational college and musical school. Other buildings are used by different departments of City of Seinäjoki, such as dental clinic, environment department, etc.
Main Stakeholder: Main stakeholder is the City of Seinäjoki, which owns the buildings, maintains them and it is as well one of the users of the buildings.
Refurbishment Project: The replacement of inner windows, it has been installed the Ground Source Heat Pump, a renewable energy source which can be used for heating and cooling with relative reduction of energy consumption and carbon emission. Buildings are connected to city district heating network and most of them have mechanical ventilation. In the district 1200m^2 of solar PV panels have been installed.
Interconnection with NewTREND: Through NewTREND, building users will have higher impact on the retrofit than it would be done without it. Another impact would be modelling of the whole pilot site area, simulating building synergies, checking the feasibility of renewable energy sources and finding the optimum building retrofit solution.







Hungarian Pilot Project: Bókay Árpád School

Location: Bókay Árpád Primary School and Bókay Garden are placed in XVIII. District of Budapest, Hungary.
General Information: The pilot-site is the historical building of the Bókay school and the nearby Bókay Garden. The building level demonstration and validation is the Bókay Árpád Prmary School,an eco-school,built in 1903 with a net floor area of 2200 m^2.The neighbourhood level consists of the Bokay Garden, a multifunctional park including a historical building, swimming pool, nursery and community centre with a total area of 16 hectares.
Main Stakeholder: The Municipality of XVIII. District, the end users are the teachers and students of the school with a number of external parties involved,uch as the operator of the building, local authorities, tendering constructors and local inhabitants.
Refurbishment Project: The planned retrofit measures of the school include envelope insulation, replacing the windows and doors and installing solar panels on the roof. The long-term renovation plan for the Bokay Garden includes the extension of the swimming pool along with renovating the existing sport infrastructure and the possible utilization of neighbourhood level energy sysnergies.
Interconnection with NewTREND: NewTrend retrofitting methodology will be tested on both building and neighborhood level. NewTREND supports the monitoring based assessment of the main building, NewTREND design methodology will be used for the refinement of the longterm plans on the district level, NewTREND gives guidance and support of stakeholder and end-user engagement.

Spanish Pilot Projects: Sant Cugat del Vallès, Spain

Apartment for young people located in Can Trabal neighbourhood, Sant Cugat del Vallès, Spain.

General Information: Three connected buildings by two stairways consists of five levels with 35 apartments, nine parking places and one local with commercial use. The building was built in 2008 and its net build area is 1657,5 m^2.
Main Stakeholder: Promusa (public company, the Local housing Office manager), Energea (Energy management company), Users/Tenants (50 occupants in 35 dwelling) and City Council of Sant Cugat del Vallès (Owner).
Refurbishment Project: Replacing existing thermal panels(PV panels for community spaces and solar thermal panels for heating /DHW),apartaments individual electrical metres,change of light sensors,replacement of collectors of hot water,improvement of the control System,unification of electric metres,legalization of self-consumption.

Pins del Vallès School, 51 Can Volpelleres Avenue, Sant Cugat del Vallès, Spain.

General Information: Consists of four buildings (Primary School Building, Administration Building, Sport Pavilion, Kindergarten) and the students are 450. The buildings were built in 1980 and its total net build area is 3396,50 m^2.
Main Stakeholder: AMPA (Parents association), Veolia (Energy management company), Users (teachers and students)and City Council of Sant Cugat del Vallès (Owner).
Refurbishment Project: Installation of PV panels, LED Technology lamps, replacement of the atmospheric boilers to condensing boilers, zoning of the heating System, reduction of energy demand through the façade retrofitting.

2private houses in Les Planes,6 Major del Rectoret Street, 3 Carena Street, Sant Cugat del Vallès, Spain.

General Information: located in the south of Sant Cugat, in a forest area. Net build area for Rectoret Street is 61,56 m^2 and for Carena Street 70 m^2. The neighbourhood has a low social and economic level.
Main Stakeholder: ETSAV–UPC (faculty of architecture), Arqbag, Users and City Council of Sant Cugat del Vallès.
Refurbishment Project: Monitoring the main data, design cheap retrofit actions, replacement of current windows, installation of two PV kits, reduction of energy demand through the roof retrofitting and insulation of envelope.