



# Klimahouse Future Report

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# Klimahouse Future Hub

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“In the Age of Experience, we need to re-think the space we have to accommodate our diverse and evolving lifestyles  
*H.S. Kim*



## Will the home of the future be run by a tennis ball-shaped robot?

From the Internet of Things to Intelligence of Things. According to data presented at CES Las Vegas in early January 2020 by the Consumer Technology Association, 5G connections will completely overtake 4G in 2022, but as early as 2021 will have already become a force to be reckoned with. The development of new super-fast low-latency connections will be rapid and unstoppable. The definitive arrival of 5G on the market will revolutionise the very concept of IoT (from Internet to Intelligence of Things), bringing with it an explosion in the field of the smart home: no longer will it be an area where some objects connect to the internet to be controlled one by one by the user, instead it will finally be a neural network of smart devices with a functioning digital brain. This concept is symbolised by Ballie, the robot companion presented by Samsung that could change the very idea of what a robot is, being a fusion of voice assistants and robotics. Slightly larger than a tennis ball and equipped with a video camera, Ballie follows its 'master' around

the house, offering assistance, acting as a personal trainer, and when the owner is not at home it operates the other intelligent electrical appliances, runs the home, and can even tell the user what their child or pet is doing.

It is difficult to say whether or not Ballie will be successful, but what is certain is that the consumerisation of artificial intelligence will have its greatest success in the home: an environment where huge, flexible screens will redefine room space, following the nomadic habits of the people who live in it, people who will need a living space that can be thought of and reconfigured as an office, a gym, a cinema or even a shop. An intelligent space where Alexa and OK Google will now have a ball-shaped robot as a competitor.

*Luca Barbieri  
Scientific Director Future Hub*





# The numbers of the future

by Donatella Bollani



# Growth of the real estate market and innovation of services

## The real estate market

The **Nomisma Report**, presented in November 2019, showed a rise in residential property prices in the main Italian cities for the first time in ten years. The rise was very slight, at +0.2% (-0.9% in 2018), but nonetheless marked a new trend, although it was limited to areas in which economic growth is more significant. **According to Nomisma's predictions this year the overall real estate market, including non-residential properties, will see 662,000 deals completed, 92% of which will take place in the residential sector. Over 590,000 residential properties will have been bought and sold by the end of 2019, a number which will drop back down to 589,000 in 2020, before rising to 617,000 in 2021.**

Despite this, the Italian property market is not – for now – feeling the pinch of economic instability. “For the first time in ten years the semi-annual shift in residential property prices in the main Italian cities is in positive territory” stated Nomisma. In the period from 2008 to 2019 when examining the aggregate figures for the main markets, the cities with the best residential performance compared to 2008 levels were Milan and Bologna, to which one can also add Padua, a smaller market but one that registered an increase of a thousand deals completed in relation to the 2008 figure of 2,400.

## A big rise in rentals

As far as rentals are concerned, **the sustained demand for residential property rentals, both short and long term**, has led to a resurgence in rental prices, which registered a rise for the second consecutive year, although the rises are of less than 1% per year. Turning to the level of discounts agreed during the negotiation phase, the percentages are rather high (13.4% on average) compared to the pre-economic crisis levels, apart from in Milan where discounts proved to be around 8.5%. It is important to underline an important trend which has taken the demand for rentals to be 50% of the total demand. **Italy is a more mobile country than in the past, and there is also constant rise in the demand for temporary use, which has grown from 11% to 18% in a year. In certain cities like Venice, Bologna and Florence, this is over 20%.**

## International attractiveness

The Italian property market is confirmed as being highly attractive, so much so that in 2019, 11 billion euros of investments are expected, with 4 billion euros predicted to be invested in the last trimester of the year alone. These figures are notably **higher than the average recorded for the last 5 years**, which was 7.9 billion euros per year, according to the **Coima Real Estate Forum** (October 2019). 23% of these capital flows come from domestic investors, and **77% from international investors**: 22% of the international capital comes from North America, followed by France (23%), the UK (10%), Germany (8%), the Asia Pacific region (5%) with other investments being fragmented between the remaining financial markets.

**The Milanese market** has been confirmed as guaranteeing returns equal to those of London and Madrid (3.5%) and higher than those of other European cities like Frankfurt (3%) and Paris (2.75%).

The Italian market has registered significant demand for high quality commercial rents, with clients looking for flexible spaces in prime locations that meet the criteria of high sustainability, coming equipped with certifications of international excellence, and being technologically ground-breaking.

The main opportunities can therefore be identified in the **redevelopment of obsolete and inefficient stock**. Despite standing out in many areas, Milan for example has only 11% of Class A buildings compared to 46% in London.

A particularly interesting **asset class** is that of tourism: thanks to its status of fifth most visited destination worldwide, Italy had registered over **2.6 billion euros of investment in the hotel sector** by the end of September 2019, with an aggregate growth trend of 26%.

## The future lies in services

From the fifth “Report on the property services industry in Europe and in Italy” released by Scenari Immobiliari in October 2019, it emerged that **Italy has been confirmed as the country where real estate companies, representing 11.9% of GDP, carry most weight in terms of the national economic scenario**. If this figure is then combined with property development, which accounts for 2.9%, and the construction sector

at 4.2%, then the industry total rises to 19% of GDP, above the European average of 18.3%. After Italy comes the UK (18.8%), followed by France and Spain, while Germany finds itself a couple of percentage points further down the ranking.

In Italy, the number of **people working directly or indirectly in the property services industry (from planning to sales) is over half a million, a rise of 15.8% in five years**, creating annual revenue of 41 billion euros, out of an estimated total of 380 billion euros for the five main European countries (Germany, United Kingdom, France, Italy, Spain).

From a further comparison with other countries, it emerges that **the average size of Italian service companies has been confirmed as getting smaller** (1.3 workers per company), highlighting that the companies in the real estate sector are less structured than in other productive sectors.

“The world of property services is undergoing a profound transformation, led by new demand for innovative services connected to the diverse needs that real-estate professionals have” confirmed **Francesca Zirnstein, Managing Director at Scenari Immobiliari**, who continued: “Digital innovation is changing the way in which buildings are designed, built, used and managed, and therefore all the fields that together make up the property services industry have to adapt to this new environment”.

For buildings equipped with integrated technological systems, IT systems and security systems, advanced ICT capabilities are essential. Experts in this field who will need to be able to read and analyse data but also interact with those who possess consolidated skills and market knowledge in the real estate sector will be indispensable. It is exactly **this fusion between the property sector and digital solutions that led to the new term ‘proptech’ being coined** (from the combination of the words ‘property’ and ‘technology’). Today the relevance of proptech is starting to be understood in Italy too, along with the realisation that in 2020 proptech will be a worldwide market worth 4.5 million dollars, according to JLL. Digital solutions are revolutionising all the various fields of the real estate business: from the buying and selling of real estate,

Rise in residential property prices in the main Italian cities

**+0.2% (-0.9% in 2018)**

Source: Nomisma Report, November 2019

Demand for short-term lets

**Rising from 11% (2018) to 18% (2019)**

Source: Nomisma Report, November 2019

Capital flows into Italian real estate

**23%** comes from domestic investors

**77%** comes from international investors

Source: Coima Real Estate Forum, October 2019

Real estate investments 2019:

**11 billion euros**

Average real estate investments 2015-2019

**7.9 billion di euros**

Source: Coima Real Estate Forum, October 2019

Real estate companies in Italy in 2019: 11.9% of GDP

**Property development (2.9% of GDP) + the construction sector (4.2% of GDP) = industry total of 19% of GDP, higher than the European average of 18.3%**

Source: 5th Scenari Immobiliari Report on the real estate service industry in Europe and in Italy, October 2019

Workers in the real estate services-proptech industry (from planning to sale)

**Over 500,000 + 15,8% over five years**

Source: 5th Scenari Immobiliari Report on the real estate service industry in Europe and in Italy, October 2019

to risk-analysis and financial-prediction models, from asset management to the dynamics surrounding the financing of development projects. In order to be able to face such challenges, companies that operate in the world of property services will need **significant investment**, mainly in new technologies and IT systems, as well as in developing a constantly evolving range of new skills. This will lead to better structured companies, through networks that will allow growth and investment in skills and digitalisation.

# Construction, looking to the future

## A strategy for innovation

Low energy-consumption buildings, developing the circular economy, the use of energy from renewable sources and construction sites with a low environmental impact are the challenges to face in order to achieve economically, socially and environmentally sustainable development, according to ANCE, the Italian Association of Building Constructors. In particular, ANCE states that because of the characteristics of the construction sector, which mean that every project is essentially a prototype which involves input from a high number of people, an *ad hoc* plan is required to obtain the desired results of innovation and an increase in productivity to levels that other industrial sectors have already reached.

For this reason the association has published a brief “**practical guide to innovation in the construction sector: strategies, process digitalisation, investment in research and development, and training**” (December 2019), which outlines the **innovation goals**, and identifies the **strategies to achieve them in six separate points** relating to **process digitalisation**, **investment** in research and development, worker **training**, and **simplification** and reduction of **administrative procedures**

1. **Adopt a national digitalisation strategy**; the proposal is to create a specific national digital platform for the construction projects. This would be free of charge and open to the public, and would assist those involved in the project, like architects, construction companies and producers of materials and technologies.
2. **Support the digitalisation of companies**. The aim is to update the list of goods which will facilitate a digital

**The management of complex buildings and entire residential areas is also changing**. The big technological players have already launched systems like Microsoft Azure-Digital Twins, based on the IoT, which allows an infinite number of integrated controls: maintenance predictions, real time analysis of energy requirements, space management and optimisation, access control and even the coordination of drones assigned to monitor security in certain areas.

and technological transformation of construction companies, as well as the list of intangible goods like software, systems and platforms, connected to investment in tangible goods, to suit the specific characteristics for the construction sector. It is also necessary to adapt the non-repayable disbursement for consultancy services aimed at a digital and technological transformation of companies to the needs of the construction sector, by introducing pre-requisites regarding the authorisation of consultants which are more relevant to the construction sector.

3. **Foster investment in research and development and the financing of a three-year plan for innovation in the construction sector**. ANCE will work towards adapting the regulations regarding tax credits for research and development, to take into account the characteristics of the construction sector, financing a three-year plan which would involve the participation of both entrepreneurial associations and the bilateral system of construction training schools, to support SMEs in their adoption of innovative solutions and processes.
4. **Support the training of workers in the construction sector**. According to ANCE, it will be indispensable to insert the skills needed for industry 4.0 on to courses in universities and technical high schools. Training pathways need so be financed so they can be accessed free of charge by those who already work in the construction sector, and the bilateral system of construction training schools need to be among the entities that can deliver this training. The measures to support training 4.0 should be reaffirmed for at least five years, while

introducing specific corrective measures to better adapt these measures to the construction sector. An employment bonus should be provided to aid the hiring by construction companies of young people undertaking professional qualifications, through a mechanism of ten-year total tax exemptions to be financed by European structural funds.

5. **Simplify procedures and reduce paper documentation**. The electrification of official documentation will give legal validity to digital documents, allowing companies that have adopted digital management procedures to avoid the paper/digital duplication of the various documents required.
6. **Give impetus to sustainable construction to complete the transition to ‘circular’ economic model**. A plan for the circular economy in the construction sector should be launched. This will mean adopting a normative framework (End of Waste decrees) that simplifies and facilitates reuse of materials resulting from construction and demolition. Standardised, recognised criteria should be agreed upon and used by the construction industry collectively. Half of all raw materials – as the association explain in their report – are used for the construction of buildings. 40% of final energy consumption is linked to the operational phase of buildings while in the construction phase of the building, the CO<sub>2</sub> emitted by the production of the necessary materials represents between 10-20% of the CO<sub>2</sub> emitted by the building during its entire life span. Moreover, waste from construction and demolition represents one third of the waste produced in Europe, the majority of which could be reutilised if there were a clear legal framework oriented towards recycling and reuse. ANCE therefore suggests that a plan be launched for the circular economy in the construction sector, that a normative framework that simplifies and facilitates the reuse (End of Waste decrees) of construction materials be adopted, and that standardised, recognised criteria, agreed upon by the construction industry as a whole be introduced

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**40% of final energy consumption is connected to the operational phase of buildings, while in the construction phase of the building the CO<sub>2</sub> emitted to produce construction materials represents 10-20% of the CO<sub>2</sub> emitted by the building in the whole duration of its life-span**

*Source: Practical guide to innovation in the construction sector, ANCE, December 2019*

**Waste from construction and demolition represent a third of waste produced in Europe**, the majority of which could be reutilised if there was clear legislation addressing the question of recycling/reuse.

*Source: Practical guide to innovation in the construction sector, ANCE, December 2019*

**Routine and unplanned maintenance of existing building stock**, which represents the **largest portion of the construction market with over 70% of the total**, will register **growth rates of just above 1.5% per year**.

This is a limited but constant activity, sustained by fiscal incentives, which **in the period 2013-2019** fostered **over 28 billion euros of works per year**.

*Source: 27<sup>th</sup> Economic analysis and prediction report, CRESME November 2019*

**The plant design and installation market** for the construction industry has grown, registering a **rise of 3.7% compared to 2017**, registering a current total of **62.5 billion euros**.

*Source: 27<sup>th</sup> Economic analysis and prediction report, CRESME November 2019*

As far as **public sector construction** is concerned, in **2020 a 4.5% rise** compared to the previous year is predicted, as well as a **3.5% rise in 2021**, a **2.5% rise in 2022**, a **1.5% rise in 2023**, and a **1.5% rise in 2024**. This growth is connected to the noticeable recovery in investments by the main managing authorities of both local and national infrastructure networks which has been taking place since 2018, and by public bodies, particularly municipalities, since 2019.

*Source: 27<sup>th</sup> Economic analysis and prediction report, CRESME November 2019*

Investments in **new construction** projects indicate a positive outlook for the whole of 2020 when compared to the previous year. The same is also valid for investments in renewal: **from +1.8% in 2020 to +1.4% in 2024**, but with very low production levels.

*Source: 27<sup>th</sup> Economic analysis and prediction report, CRESME November 2019*



“ Compared to computers, man is better at thinking big, and this won't change for a while yet

*Thomas Hayes Davenport*

The 27th Economic Analysis and Prediction Report by CRESME describes a recovering market in which **all the driving forces behind new construction projects seem to have started to move forward again**. Included among the signs of recovery are public works, which in terms of the sums paid for works put out to tender, in 2018 and 2019 returned to levels last seen in the early 2000s.

### The retrofit market

According to the report, providing crises exogenous to the construction sector do not occur, the next three years could be characterised by a stable recovery in the construction and public works sectors. While of course not at levels seen before the great real estate crisis of 2008-2009, these would represent stable signals of recovery.

**Routine and unplanned maintenance of existing building stock**, which represents the **largest portion of the construction market with over 70% of the total**, will register **growth rates of just above 1.5% per year**. This is a limited but constant activity, sustained by fiscal incentives, which **in the period 2013-2019 fostered over 28 billion euros of works per year**. The only risk for this activity, apart from general economic risk, is **linked to support schemes** and temporary incentives, with those relating to seismic risk or recently created for the redevelopment of facades currently being the most appealing.

According to the data provided by Cresme, in 2018 the plant design and installation market for the construction industry grew, registering growth of 3.7 per cent compared to 2017, reaching a total of 62.5 billion euros. The plumbing system market was worth 21.3 billion, the installation of electronic systems and components more than 25 billion, other plant accounted for 5.5 billion, while installation by construction companies and, above all, by non-specialised companies reached 10.7 billion. When one speaks of 'green construction', the plant design and installation market is thus confirmed as fundamental, involving as it does plant producers and installers, a market segment that is characteristic of the Italian scenario.

### New constructions

Investment in **new constructions**, according to predictions by Cresme, will be in positive territory compared to the previous year for the whole of 2020. The same can be said for investments in renewal: from **+ 1.8% in 2020 to +1.4% in 2024**. New residential and non-residential constructions have returned to growth once again, levels of production are very low however, but the relationship between demand

and completed constructions has changed compared to the past. The demographic dynamics of the past have changed, in a country witnessing a fall in population, along with the internal migration flows concentrated in the most attractive areas which are able to successfully compete with other cities.

### Public works

Public construction projects represent another positive set of figures. Researchers from the Roman institute **predict a 4.5% rise in 2020** compared to the previous year, a **3.5% rise in 2021**, a **2.5% rise in 2022**, a **1.5% rise in 2023**, and a **1.5% rise in 2024**. Growth linked to the noticeable recovery in investments by the main managing authorities of both local and national infrastructure networks which has been taking place since 2018, and by public bodies, particularly municipalities, since 2019.

In 2019, based on the number of published invitations to tender, the most dynamic sector was **school construction**, with growth of 29.5% compared to the previous year. The amounts spent on public works grew too (+61.9%), thanks to the decisive contribution of municipalities, provinces, metropolitan cities and universities who invited tenders for various types of project. 2019 also saw a consolidation in the demand for works in the fields of street maintenance, water supply, green spaces and street furniture.



# Green economy

2019 marked a record-breaking year for eco-investments, which reached a value of 21.5%, which corresponds to 300,000 businesses and is 7.2 percentage points higher than in 2011. These are some of the data released by GreenItaly in November 2019: the tenth report by Symbola Foundation and Unioncamere – promoted in collaboration with Conai, Ecopneus and Novamont, in partnership with Si.Camera and Ecocerved, and with the patronage of the Ministry of the Environment – a report which measures the strength of the national green economy.

**Over 432,000 Italian industrial or service companies invested in green products or technologies to reduce their environmental impact, save energy and limit CO<sub>2</sub> emissions between 2015-2018, or planned to do so before the end of 2019. Almost one Italian company in three, 31.2% of the whole non-agricultural business community. And in the manufacturing sector the ratio is more than one in three (35.8%). Last year alone, almost 300,000 companies invested in sustainability and efficiency. “When we published the first Green Italy Report ten years ago, there were just 25GW of solar panels installed worldwide: now there are 660GW” said Ermete Realacci, President of the Symbola Foundation, who continued: “Technology has made enormous progress in the last 10 years and according to UNEP, the cost of electricity from solar power has dropped by 81% while the cost of electricity from wind power has fallen by 46%. We already have a more sustainable and manageable economy which combines innovation and quality with values of social cohesion; research and technology with design and beauty, industry 4.0 and traditional knowledge. A social and productive model that offers Italy the chance to have an important international role: Italy is already the European superpower of the circular economy with 79% of total waste directed towards recycling, a rate much higher than other large European countries: France 55%, Great Britain 49%, Germany 43%. The Italian green economy is the most advanced frontier, able to seize these new opportunities.**

## Exports and innovation

These ‘GreenItaly’ companies are clearly more dynamic when it comes to foreign markets compared to the rest of the Italian productive system: with specific reference to manufacturing companies with between 5 and 499 workers, **51% of eco-investing companies saw an increase in exports in 2018, compared to 38% of non-eco-investing companies.** These companies innovate more than the others: 79% of eco-investing companies developed innovations, compared to 61% of non-eco-investing companies. This kind of innovation is also relevant for Industry 4.0: while 36% of eco-investing companies has already adopted or is adopting plans to activate measures relating to the Industry 4.0 plan, only 18% of non-eco-investing companies can say likewise.

## Employment and innovation

In 2018 the number of green workers in Italy exceeded 3 million: more precisely 3,100,000 or 13.4% of all employees (up from 13% in 2017). **Green employment therefore rose in 2018 by over 100,000 compared to 2017, an increase of 3.4%, while employment for other roles rose by only 0.5%.** Among the most sought-after positions in the sustainability sector in the coming years will be: food supply-chain experts, organic food production experts, installers of networks, of electrical systems, of high-efficiency heating and cooling systems, mechatronic technicians, energy engineers, distributors and vendors of green products for the architecture and construction sectors, environmental lawyers, environmental IT technicians, and specialists in green accounting.

Age is also an important factor in the green economy. The Italian manufacturing sector is being driven towards environmental sustainability by young entrepreneurs: 47% of businesses run by under 35s have made eco-investments, against 23% of businesses run by over 35s. Green economy also means taking care of social cohesion: 56% of green businesses are socially cohesive, that is to say they invest in the social and economic wellbeing of their workers and of the community to which they belong, and engage with the other actors in the local area (other businesses, stakeholders, non-profit organisations, etc.). Among businesses that don’t make green investments, the proportion of socially cohesive businesses is just 48%.

## Italy: European leader

GreenItaly companies, including SMEs, have driven the entire national productive system forward as well as making Italy the leading European country for environmental performance. This position as European leader goes hand in hand with Italy’s primacy in competitiveness. The more than 430,000 green Italian businesses have made Italy the leader in sustainability, which can be illustrated by findings showing that **the Italian industrial system uses 14.8 tonnes of oil equivalent for every million euros produced, putting Italy in second place out of the big EU countries in terms of energy input per unit produced.** Italy is behind Great Britain (13.7 tonnes of oil equivalent, although it has an economy which is driven to a large extent by finance), but ahead of France (15.6), Spain (17.3), and Germany (17.8). These findings are replicated material input: with 285.9 tonnes per million euros produced, Italy is behind Great Britain (240.1), but ahead of France (340.5), Spain (355.3), and Germany (399.1). Italy is also the most efficient in terms of waste reduction: Italian companies produce 43.2 tonnes of waste per million euros produced, while Spanish companies produce 54.7, British companies (63.7, German companies 67.4, and French companies 77.4. Italy also performs well in terms of climate-changing emissions: with the equivalent of 97.3 tonnes of CO<sub>2</sub> per million euros produced, only France (80.9, thanks to their strong nuclear power sector) and the United Kingdom (95.1) have better results, while Spain (125.5) and especially Germany (127.8) lag some way behind. In recent years Italy has become **the world’s fourth largest producer of biogas**, after Germany, the USA and China. What is more, Italy is also a world leader in green chemistry.

## Patents and certifications

The attention companies pay to the environment can also be measured by the **growth of green patents** in Italy: 3500 in total (10% of all European patents). With a rise of 22% in the period from 2006-2015, this goes against the trend for patents in general. Italy is also the third most prolific country in the world for the number of ISO 14001 certifications, behind China and Japan but ahead of Spain, Germany, France and the USA.

**Almost one Italian company in three, 31.2% of the whole non-agricultural business community, and in manufacturing more than one company in three (35.8%) invested in green technologies or products between 2015 and 2019.**

Source: GreenItaly Report, Symbola Foundation, November 2019

## Italy is the European superpower

**of the circular economy with 79% of total waste directed towards recycling, a much higher rate than other large European countries: France 55%, Great Britain 49%, Germany 43%.**

Source: GreenItaly Report, Symbola Foundation, November 2019

## Green employment rose

**by 100,000 in 2018 compared to 2017, an increase of 3.4%, while employment for other roles rose by only 0.5%.**

Source: GreenItaly Report, Symbola Foundation, November 2019

## 47% of businesses

**led by under 35s made eco-investments, compared to 23% of businesses led by over 35s**

Source: GreenItaly Report, Symbola Foundation, November 2019

## 51% of companies

**that made eco—investments signalled an increase in exports in 2018, compared to 38% of those that didn’t make eco-investments.** Eco-investing businesses also innovate more than other businesses: 79% of them developed innovations compared to 61% of non-eco-investing companies.

Source: GreenItaly Report, Symbola Foundation, November 2019

## Green patents are growing

**in Italy: 3500 green patents in total (10% of all European patents) with an increase of 22% for the period 2006-2015.**

Source: GreenItaly Report, Symbola Foundation, November 2019

# Digital Innovation in construction planning and in facility management

## European digital divide

In the Digital Economy and Society Index (Desi Report, June 2019), the **index created by the EU Commission** to measure the state of implementation of the Digital Agenda in EU countries, Italy is placed fifth from last, far behind comparable countries such as the UK, Spain, Germany and France.

The areas in which Italy lags behind were highlighted in the Desi report and are as follows: human capital (26th place), internet use (25th place), and the integration of digital technologies (23rd place). In areas such as connectivity (19th place) and digital public services (18th place), Italy fared slightly better. **Italy is improving more quickly than the rest of Europe: Italy's total score in this Desi report rose by 5 points (from 38.9 in 2018 to 43.9 in 2019), compared to an average rise of 2.7 points for other EU countries. No other country recorded a rise as high as Italy's.**

## A digital revolution

A panel of over 600 operators, including construction planning companies, engineering companies, construction and maintenance companies, public and private sector clients and material and component manufacturers, took part in the survey published in the BIM report by Assobim – the association created to promote the diffusion of Building Information Modeling and to support the whole BIM technological industry – in June 2019. This 2019 report provides an accurate portrayal of the diffusion of BIM in Italy and brings into focus the strengths and potential for development that this methodology can provide, as well as further increasing awareness of BIM among institutions and major players in the construction industry.

The participants in the survey were made up in large part of construction planning firms (over 62% of the survey) of generally 10 employees or less (in 76% of cases) and in 75% of cases with revenue of less than one million euros (proportions that accurately reflect the scale of Italian construction-planning firms). The respondents gave generally positive opinions: over half of those surveyed know and use the BIM methodology, while around another 40% know it but do not use it, or

use it only partially, and only a very small number of cases (less than 10%) do not know it.

Equally significant were the answers to the question about the timing of the introduction of BIM in the respondents' companies: **constant growth is visible from 2012 onwards, reaching its peak in 2018, the year in which almost 17% of those surveyed introduced Building Information Modeling in their companies. This data is supplemented by statistics regarding those who don't yet use BIM: around 11% plan to introduce it in the next year, and almost 20% plan to introduce it in the next three years.** The answers to two further questions help to better define the context of this positive trend. Almost half of those surveyed declared that they have adopted BIM for their projects either extensively (22.94%) or partially (24.21), but almost 60% of those interviewed have used it in less than half of their projects, while around 14% have applied in it all their completed projects.

## The advantages

**Over 70% of respondents are very sure or quite sure that the adoption of BIM contributes or would contribute significantly to the reduction (by up to a third) of initial construction costs and costs related to the entire life cycle of the building, not to mention the reduction (by up to half) of the total time necessary to carry out the work, from the beginning to the end of the construction project.**

Over 55% of respondents judged the adoption of Building Information Modeling to be very or quite advantageous, while a further 17% defined the advantages obtained as sufficient, and only 10% judged them to be inadequate. Those surveyed were more doubtful about BIM's contribution to the reduction of environmental impact of construction work, and regarding the trade imbalance between imports and exports of construction components and materials, aspects about which two thirds of respondents expressed their reservations.

## Problems

Among the problems and obstacles most commonly perceived by operators regarding the implementation of BIM, the most evident are **the lack of relevant**

**skills in their company** (highlighted by over 60% of those surveyed), and consequently, **the lack of adequate training** (underlined by around 65% of those interviewed). The already cited lack of demand is another important factor for over 70% of the panel, as are the costs of implementation (over 60% of respondents) and the lack of time (over 50%).

## BIM in public works

In 2019 demand continued for construction planning services that use electronic modelling tools and methods for construction and infrastructure, a category to which BIM belongs. The data outlined in the 27th Economic Analysis and Prediction Report from CRESME (November 2019) are as follows: the number of tenders rose from around 30 in the two-year period 2015-2016, to 103 in 2017, and subsequently tripled to 304 in 2018. In 2018 the total value of government tenders rose to 242 million euros, well up on the 2017 figure of 117 million euros. This trend of growth of tenders using BIM looks set to be consolidated in 2019, considering that in the first ten months of 2019 growth of 20% was visible both in terms of number and value of tenders, in line with the overall growth in construction planning tenders. The distribution of tenders using BIM by total project value highlights a greater concentration of tenders using BIM among high-value projects above 200,000 euros. In 2019 this type of contract accounted for 146 tenders (71% of the total), with a total value of around 152 million euros (96% of the tender market). BIM is used in all geographical areas. In 2018 tenders using BIM represented 5.9% of all tenders and 31.2% of the total value of tenders, in the first ten months of 2019 tenders using BIM represented 5.4% of tenders and 18.1% of the total value of tenders.

## The constant rise in the use of BIM

**(Building Information Modeling) reached its peak in 2018, the year in which 17% of businesses surveyed introduced it into their company.** Those statistics can be supplemented by the fact that of the businesses not using BIM, around 11% planned to introduce it within a year and almost 20% planned to introduce it within three years.

*Source: BIM Report, Assobim, June 2019*

## Over 70% of businesses surveyed

**were very sure or quite sure that the adoption of BIM would strongly contribute to the reduction (by up to a third) of initial construction costs and costs related to the entire life cycle of the building, not to mention the reduction (by up to half) of the total time necessary to carry out the work, from the beginning to the end of the construction project.**

*Source: BIM Report, Assobim, June 2019*

## In 2018 the total value of construction planning

**tenders using BIM rose to 242 million euros, compared to 117 million in 2017. This trend of growth in tenders using BIM seems set to be consolidated in 2019, considering that in the first ten months of 2019 growth of 20% both in terms of number and value of tenders was visible.**

*Source: 27th Economic analysis and prediction report, CRESME November 2019*



# IoT, AI and Smart Living

Thanks to a penetration rate of 41% (with penetration defined as Italians who possess a smart household device) the smart home is a phenomenon which is continuing to grow: the market for devices and equipment for connected houses was **worth a total of 380 million euros in 2018, up 52% on 2017**. Not only are these products winning over Italians, but they are also contributing to the development of the IoT market, according to the data provided by the Internet of Things Observatory from the School of Management at Politecnico di Milano (April 2019).

Customers who choose to bring intelligence into their home do so primarily for security related reasons, and products and devices to protect the home account for sales of 130 million euros (35% of the overall market).

## Catching up with Europe

In Italy, awareness of the possibilities regarding the smart home and domestic applications for the Internet of Things is increasing, along with the total value of the market, leading to a narrowing of the gap with other markets thanks to highly superior growth rates. Although in terms of **total market size the gap remains large**, this sector is developing more quickly in Italy than other countries. **Germany remains the first-placed European country with a market worth 1.8 billion euros and a growth rate of 39%**, followed by the **United Kingdom at 1.7 billion euros** with an identical growth rate of 39%, and **France further behind at 800 million euros** but with a growth rate of 47%, which is more similar to Italy's.

## Voice assistants

As was predictable, given the high concentration of advertisements during 2018 for home speakers, the second factor that brought the smart home ever closer was the popularity of products based on **voice recognition**, products which now account for 16% of the market with a total value of **60 million euros**. The arrival in Italy of the big over-the-top (OTT) companies with their smart home speakers like Google Home and Amazon Echo has revolutionised the connected house, bringing with them investments in terms of communications and marketing which have never been seen before, driving sales of other

connected objects too, particularly those linked to heating and lighting. This growth trend in the Italian market is comparable or even greater than in the main European countries, although as already stated, the gap in total market value is still wide.

## Heating and lighting

The search for the right balance between reducing energy consumption and finding new forms of comfort has driven sales of products for **intelligent heating and room monitoring** so much that air conditioners, heating systems and control systems now constitute a business worth **45 million euros**, 12% of the overall market. These devices have benefitted from the arrival in houses of voice recognition products designed to simplify internet searches and interaction with other electronic devices. More traditional **household appliances** have also benefitted from the introduction of home speakers, and not only for voice commands. Other functions, in particular solutions based around mobile phone apps, mean that washing machines, refrigerators and other appliances connected to the IoT have generated a total of **55 million euros, accounting for 14% of the total market**. **Lighting** is another field where comfort and energy efficiency come together, and these devices are convincing users to the point where demand has grown by 50% for domestic lighting management products, principally smart light bulbs.

## Usefulness and complexity

The fact that in 42% of cases the smart functions of these products are not used, or are used only occasionally, suggests that customers may attribute a low level of usefulness to the products, while another interpretation could be that they are excessively complicated. Consumers who don't own smart objects maintain that they don't need them (41%), that they consider them too innovative (19%), that they don't fully understand the benefits (12%) or that they have never heard of them (8%), with the latter two reasons being particularly significant. **As far as the future is concerned, more than one consumer in three (35%) intends to purchase at least one smart object: 10% plan to do so within 12 months**, while the remaining 25% have set a time span of three years.

## Online payments and AI

For some electrical appliances in particular, like refrigerators and washing machines, it is envisioned that they will integrate with the world of digital payments, and will be able to not only autonomously detect their contents or their required workload to satisfy domestic needs, but will be able to undertake more complex actions like making online purchases, thanks to their identity management capabilities and the authorisation from their owners to make orders and payments.

Numerous future developments will arrive in our homes thanks to **artificial intelligence**. There are now ideal conditions for new applications of AI to continue to evolve, and for manufacturers to take new opportunities, paying attention to the three fields that will guide this evolution: machine learning integrated with connected objects, artificial intelligence applied to voice assistants to improve their precision, and artificial intelligence for domestic service management.

## Smart homes are fast becoming a reality

the market for devices and equipment for connected houses was **worth a total of 380 million euros in 2018, up 52% on 2017**.

*Source: Internet of Things Observatory from the School of Management at Politecnico di Milano, April 2019*

## Investment in communications and marketing for voice assistants

have driven sales of other connected objects, especially those linked to heating and lighting.

*Source: Internet of Things Observatory from the School of Management at Politecnico di Milano, April 2019*

## As far as the future is concerned,

**more than one consumer in three (35%) intends to buy at least one smart object: 10% plan to make the purchase in the next 12 months**, while the remaining 25% plan to buy in the next three years.


*Source: Internet of Things Observatory from the School of Management at Politecnico di Milano, April 2019*

## Three fields will guide the evolution of the smart home:

**machine learning** integrated with connected objects, **artificial intelligence** applied to voice assistants to improve their precision, as well as playing a central role in the management of domestic services.

*Source: Internet of Things Observatory from the School of Management at Politecnico di Milano, April 2019*





“If it's digital today,  
it will be cognitive  
tomorrow

*Ginni Rometty*



**Klimahouse  
Future Hub**

## SOUTH TYROL

It produces twice as much energy as it consumes, 60% of which comes from renewable sources, and it is aiming to exceed 90% by 2050. It generates an average of 4500 GWh every year from hydro-electric power alone, without taking solar power, biomass energy or district heating into consideration. It invests in sustainable construction, it actively promotes the fight against climate change, and it intends to further enlarge its already sizeable parking facility for e-mobility vehicles. All of this means South Tyrol is Italy's 'green region': an area which specialises in renewable energy, energy efficiency and sustainability, in which research and innovation play a decisive role. The aim is to be pioneers of a new, more responsible, more balanced and more efficient way of living and working.

## CASA CLIMA

The agency CasaClima is working on the European project BuilDOP, in partnership with the Institute for Renewable Energies at the European Academy of Bolzano. The aim is to create building-assessment tools which can be used by technicians both during the design phase and the certification phase. By using CasaClima's software it will be possible to evaluate various design solutions from energy-consumption, hygrothermal, environmental and economic perspectives. As well as dynamic methods for evaluating a building's energy-related performance and assessing the risk of condensation, the environmental impact of the building during its entire life-span is also assessed. The end-product will be available free of charge to the technicians who will thus be able to call on a comprehensive set of tools to carry out building assessments using a multidisciplinary approach.

## EURAC RESEARCH

The Facade System Interactions Lab is the laboratory with which Eurac Research, an organisation which focuses mainly on the study of energy efficiency in buildings, will widen its institute's activities to include renewable energies. The new laboratory will be operative from spring 2020 at NOI Techpark, where Eurac Research already has 14 laboratories. It will host testing of sustainable heating and cooling systems, as well as verifying the thermal and energy-related performance of the building envelope, in addition to the study of photovoltaic systems and the analysis of the hygrothermal behaviour of construction materials. The Facade System Interactions Lab will be made up of a testing chamber mounted on a rotating platform, in which performance tests will be carried out

on multifunctional facades. The tests will evaluate the facades' impact on internal living comfort, both from a thermo-hygrometric and visual perspective, while also taking air quality into account.

The result will be a new frontier in home living, which will allow the creation of ever more sustainable buildings that ensure perfect living conditions.

## FRAUNHOFER ITALIA

The construction site of the future will speak a digital language, something that Fraunhofer Italia knows well as it prepares to launch its BIM Simulation Lab at NOI Techpark.

Already specialists in the Building Information Model, the industry standard for IT systems in the construction industry, Fraunhofer Italia is developing a laboratory that allows for the visualisation, modification or transfer of digital information during the life cycle of a construction project, from the planning phase to the execution phase, including the maintenance phase. All this via three applications that will simplify access for external users: the Field2BIM tool, a software library for semi-automatic data-transfer from the real world to the digital world using computer vision and machine learning techniques; the BIMobility simulator, to plan for the integration of electrical mobility systems, and the BIM2Field tool, an application which allows construction sites to be managed digitally with lean construction management techniques. New systems, and above all, a new construction culture.

## NOI TECHPARK

It was created thanks to the insight of the tech company Mas Roof and took off thanks to the green-technology experts at NOI Techpark, who have always been first in line to accompany enterprises in the development of innovative projects. We're talking about the first, revolutionary multifunctional roof that contains the solar panels and electrical circuits needed to power its thermal insulation systems. An 'all-inclusive', intelligent and eco-sustainable roof, which only became reality thanks to the support from NOI Techpark.

This innovation area in South Tyrol helped the company to find the best technological partners on the market, and to create a project team that increased its chances of accessing grants from the autonomous province of Bolzano, and to develop a real prototype which will soon be visible in the park area. This example perfectly represents the consultancy and intermediation work and the technological transfer carried out by NOI Techpark.





# Trends driving innovation in the housing industry

by Klaudie Mrkusova and Johanna Zauner,  
*WhatAVenture*







*Eight trends driving innovation in the housing industry  
From rethinking building materials or replacing them by new technologies to creating a smart, never-sleeping (efficient) persona out of your house or offices – these are the trends that are shaping the construction and housing industry in 2019/20. Keeping up with the latest trends is essential for those operating in the above-mentioned fields, particularly with respects to a harsher regulation in many countries and an overall lack of space in urban areas.*

*Furthermore, the building sector remains a resource-intensive sector in terms of energy, material and water usage and is a tremendous polluter.  
In this report, we share our view on the latest trends and selected start-ups driving these trends. The 8 major trends we identified in 2019/20 are mostly driven by the changing green mindset of inhabitants and technological pursuit of higher efficiency.*

1.

## Alternative building materials

Facing the climate change and stricter environmental policies, alternative building materials for houses are gaining their momentum across the globe. Materials must be both, more durable and as much sustainable as possible. The transformation affects all types of materials, from natural construction ones such as wood to which smart sensors are being implemented for instance, to rediscovery of “forgotten” materials such as Hempcrete. The speed of this trend derives, among others, from the fact that the construction industry accounts for approximately 20% of world emissions. Thus, the most widely spread building material, cement, whose carbon footprint is very high, might soon be in decline.

### Paleadomus

Paleodums is a start-up that creates buildings that reduce the impacts of buildings, creating houses that are energy efficient and easier to maintain.  
[paleadomus.it](http://paleadomus.it)

**Accademia della Bioarchitettura**  
Bio Construction with Hempcrete and innovative ecological solutions  
[accademiadellabioarchitettura.com](http://accademiadellabioarchitettura.com)

### WoodControl

MyMeter is a monitoring system designed to detect over time the moisture in wood structures by the mean of a network of sensors permanently.  
[woodcontrol.eu](http://woodcontrol.eu)

### Rice House

A new company that bases its work on enhancement of waste from rice cultivation and it is configured as a vehicle of innovation, with a high degree of sustainability with the chiefly targets the marketing of new materials: straw, husk, thermo plastering coat, lightened screeds and ricechaff-lime finishes.  
[ricehouse.it](http://ricehouse.it)





“It will be an era  
of entrepreneurship,  
distributed leadership,  
and the continual  
reorganization  
of people  
and resources

*Paul Michelman*

2.

## 3D printing in construction

The building industry is known for generating a lot of waste. According to various studies, between 20 and 30 per cent of material ends up discarded. This is not only inefficient but also creates additional economic burden on the company, not even talking about the environmental footprint of burning or dumping those. Thus, it is not surprising that 3D printing is a rapidly growing trend. All the necessary information about the composition of the materials or desired shape is already highly digitalized and 3D printing can be used to produce construction components to entire buildings, in the construction phase itself as well as in the interior equipment and fine-tuning. These solutions foster minimal waste as well as tailor-made solutions and lower labour costs.

### Cobod

In 2017 Cobod 3D-printed the first building in Europe – The Bod (Building On Demand). Technology was further developed in the modular construction printer Bod2. The fast development and effort led German Peri Group, the world's largest manufacturer and supplier of formwork and scaffolding systems, to acquire a significant stake in Cobod. Nowadays, the Bod2 is produced in numbers and distributed worldwide. The largest Bod2 printer is even large enough to print three storey buildings of more than 300 square meters per storey.

[cobod.com](https://cobod.com)

### Wasp

The research conducted by Wasp in the field of 3d Printing Architecture with the BigDelta Wasp 12MT, and Crane Wasp. The giants 3d printers designed for the construction of a house with materials found on site and cost tending to zero.

[3dwasp.com](https://3dwasp.com)



“Processes often become more creative when rapid iteration is affordable

*Robert D. Austin*

3.

## Zero-energy houses

Zero-energy houses are those whose energy consumed in its everyday use is equal to the energy produced on site. The most widespread solution of energy production for a “smart house” is typically a couple of solar panels on the roof linked to a battery with limited capacity. Yet, new technologies progressively appear and tackle the capacity and type of home-size storages and optimal combination of energy resources. This goes hand in hand with smart heating and cooling that need to be connected to the above-mentioned solutions, especially because they are the two most energy consuming elements of a household energy bill. On average, such houses use around 50 per cent less energy than other existing or newly built buildings. Therefore, zero-energy homes and related technologies can be seen across a growing number of buildings, even in energy-intensive types such as hospitals and restaurants. One key essential requirement to meet the net zero goal is to reduce the energy required for heating and cooling.

### Wansdronk Architectuur

Wansdronk develops a solar energy, zero-emission and material saving building concept Emporium. A warm water storage container and heat collectors provide the space heating and hot water supply. The Emporium concept is characterized as a seasonal heat storage with the smallest exergy loss (low exergy), and without any energy loss.

[wansdronk.com](http://wansdronk.com)

### Gkn hydrogen house

Gkn's first hydrogen house with the Hy2Green technology. An energy self-sufficient house in a climatically challenging position as a research project: It produces the required energy itself and stores it in the form of hydrogen for its consumption throughout the year. The first HyGreen system was implemented in a special house: A former miners' hut in the Alps, over 400 years old, secluded and without grid connection, but with its own water turbine. As the watercourse is considerably reduced in winter, an energy storage system was required that could store the excess hydroelectric power over the long term

[gknpm.com](http://gknpm.com)

### HeatVentors

HeatVentors offers efficient heating and cooling solutions for commercial and residential buildings. Their product the thermal energy storage called HeatTank is an add on for the Hvac system to make its operation more secure, clean and cheap. By using bio phase change materials, they can achieve 20-50% energy saving which reduce the operational cost, the CO<sub>2</sub> emission and provide a better certification. Counter to the water storage its size is 90% smaller to fit in every building to save space as well as energy.

[heatventors.com](http://heatventors.com)



“If you can measure it,  
you can control it  
*Andrew S.Winston*

4.

## Modular and prefabricated construction

The emergence of modular and prefabricated construction is also an exciting trend in the housing industry. It is projected to grow at a rate of 6,9% per year until 2023. Indeed, modular constructions lead to a more flexible housing market where everyone can customize his or her living in a short period of time, with the minimum of resources and energy. The former is extremely important for two reasons. First, new generations are getting more mobile and are not as attached to one house or flat as before. Second, there is less ground available and real estate prices are growing every year which makes it very difficult for some people to get living the wish. Modular constructions are also easier to recycle but mainly to refurbish into a new usage. Modular and prefabricated units are then especially convenient for scaling up for offices, hospitals or hotels.

### BioBuildingBlock

Bbb is going to be a start-up in the field of green building: going into deep it will produce BioBuildingBlocks for the realization of green buildings.

BioBuildingBlocks are innovative modular prefabricated elements produced entirely of wood to make walls, load-bearing structures or entire buildings in a rapid and economic manner. BioBuildingBlock is Patented both for Italy and Europe.

[biobuildingblock.com](http://biobuildingblock.com)

### Wood\_Space

Log houses rightly have a long tradition. Thanks to the unique properties of wood, they offer an ideal indoor climate paired with sustainability.

The innovative, sustainable and modular Wood\_Space is what you make of it. Whether it's a holiday chalet, guest house, second home, office unit, pop-up shop or creative room - the modular block construction allows full flexibility and arrives turnkey ready.

[woodspace.co](http://woodspace.co)

### Flissade

The Munich start-up flissade creates a flexible space for space-efficient living and provides answers to the challenges of increasingly scarce living space. As a flexible living concept flissade is both an interior and an exterior space - a balcony on nice days and precious living space. A movable building envelope allows the living space to be extended at any time. The previously unused potential of open spaces can thus be converted into valuable living space. Especially in times of increasing urbanization flissade provides new answers.

[flissade.com](http://flissade.com)





“It is the capacity  
for innovation  
that distinguishes  
a leader  
from an imitator

*Steve Jobs*

5.

## Energy efficiency in building design

Another trend concerns the overall conception of buildings. Architects and other building experts come up with solutions how to get the most out of the building's natural environment and loose as least as possible during its operations on the other side. Examples range from improving the air quality inside of buildings to using more natural heat from the ground as well as installing so called “low-emitting” windows which are coated with metallic oxide. During summer, they block sun's harsh rays and in winter, they keep the heat inside. There are numerous ways how to increase the energy efficiency of a building by changing the deep-rooted designs. Luckily enough, those can be applied to both, new constructions as well as renovations of existing buildings. The shift towards more energy efficient features often involves walls and facades, roofs or windows.

### Eneren

Eneren is a company dedicated to eco-sustainable air conditioning solutions. Eneren offers geothermal and aerothermal heat pumps with low Gwp refrigerants, dehumidification, air renewal and purification systems. All systems aimed at maximizing efficiency in an eco-sustainable perspective.

[eneren.it](http://eneren.it)

### Fbp

Future is a Better Place is a innovative start-up of the Focchi Group. Fbp delivers solutions for energy efficient buildings and to maximise indoor comfort for occupants. It refurbish both building envelops and Hvac systems and present Fybra, a solution to improve air quality in Schools with zero investment.

[fbplace.it](http://fbplace.it)

### Glass to power

Glass to Power is a spin-off of the University of Milano Bicocca and it realizes transparent photovoltaic panels based on an innovative and patented Lsc technology. These panels can be integrated in the architecture of modern buildings without any aesthetic impact an could generate up to 50W/sqm

[glasstopower.com](http://glasstopower.com)

### Radicsol

The Radicsol company was founded in 2018 to produce an innovative and patented system for making the concrete root beam in wooden buildings that solves the problem of ground connection by increasing the thermal insulation and simplifying the construction site.

[radicsol.it](http://radicsol.it)

### Indresmat

Indresmat is a chemical start-up that developed Extr-Pur, a new top class of Energy Saving Window made from Polyurethane (Pur): the most thermal/acoustic insulating material for windows carpentry. This new type of carpentry has been designed to increase the performance, durability and sustainability of windows just using Pur as a single structural and functional material, thus eliminating thermal bridges and enhancing the recyclability of the window at end-of-life since no separation of materials is needed if compared to difficult to recycle multi-material windows carpentry.

[indresmat.com](http://indresmat.com)





“If things are not failing, you are not innovating enough”  
*Elon Musk*

6.

## Smart homes

Savvy individuals understand that the efficiency and less carbon footprint efforts do not end with optimized construction of their houses. More and more interest is going into the field of automation of processes that in result, automatically control the building's operations. Ideally, heating, cooling, ventilation, lighting, security but also cleaning and other processes are able to align all together and achieve an excellent constellation. Just imagine your house discerns external weather conditions and forecast for the upcoming hours or even days and thus, adjusts its energetic needs. What is more, imagine that your house understands when you are in certain rooms and what habits you have, and regulates automatically the room temperature, luminosity and other features that so far, we have been in charge of or not differentiating at all.

### Graffiti for Smart City

Graffiti for Smart City was born from an idea of installing smart mosaics in the main cities of the world. Results are smartwalls composed by very thin and revolutionary biobased tiles of mosaic where technology allows to connect with smartphone, assuring different services: ability discovering points of interest, receiving information, paying parking or better drawing on the walls through the device and creating artistic compositions to share with your friends and eventually taking advantage of Wi-Fi and 5G technology

[graffiti4smartcity.it](http://graffiti4smartcity.it)

### Meo Energy

Comprising a team of architects, soft and hardware developers as well as in-house engineering experts Meo Energy was founded in 2014. This Graz, Austria

-based start-up has developed an innovative system, fully-automatically managing all energy flows – heat and power – in households. All power sources and consumers can be combined and optimised on one platform.

[meo-energy.com](http://meo-energy.com)

### Leaftech

Leaftech enables building automation systems to anticipate upcoming operating conditions, thus maximizing comfort and energy efficiency. Implementing Leaftech data services enables a transition from a reactive to a proactive control pattern reducing energy consumption by up to 20%. In order to provide the required information, Leaftech sets up a digital model of the facility in the cloud. Based on machine learning algorithms, the digital twin continuously predicts the upcoming energy demand for rooms and building segments and provides the results via Api to the building system.

[leaftech.com](http://leaftech.com)

### Rvolt

Rvolt creates a new digital experience in the energy and smart home market. The mobile application gamifies individual energy demand and empowers users to reduce their carbon footprint. Users receive transparency on their energy consumption and carbon footprint. The games makes it interactive and engaging to reduce carbon emissions and mitigate climate change. rvolts is currently in beta-testing and up for the product release.

[rvolt.io](http://rvolt.io)



“Man’s love  
of innovation  
will never die.  
I’m sure of this  
and I believe it  
passionately  
*Karl Friedrich Benz*

7.

## Upcycling & Circular economy

Recycling has already been a big buzzword for some time, but upcycling and circular economy adds a new dimension to this trend. While circular economy enhances the reuse of non-needed or thrown away materials and objects, upcycling aims at increasing their quality and environmental value. Hand in hand goes a reverse trend of individual possession and storage. Let’s forget about our grandparent’s houses where you can find objects that have not been in use for 10 years but “could be handy one day”. Non-needed objects and waste should get back to the economy as soon as possible so that their chance of being used in a different way rapidly increases. It may involve purely natural materials such as wood and stone as well as secondary, transformed, materials like ceramics or glass.

### Pcup

Pcup is an innovative, ecological and smart cup that revolutionizes the experience inside a venue or at an event. It is made in Italy. The cup is smart thanks to a chip on the bottom. The Pcup app permits different services such as the in-app order to skip the queues, contactless payments, real-time communications and exclusive content.

[pcup.info](https://pcup.info)

### Reco2

Reco2 is an innovative Cleantech startup in the green building industry. Through a virtuous model of circular economy and a revolutionary patented production process, Reco2 is able to recover and transform various types of secondary inorganic and inert raw materials (including glass, ceramic processing waste, steel mill waste, etc.), into a wide range of functional products for sustainable and green building.

[reco2.it](https://reco2.it)



“Every day we ask:  
“How can we make  
this client happy?  
How can we do  
so while getting  
ahead in innovation?”  
We ask because  
if we don’t,  
somebody else will

*Bill Gates*

8.

## Platforms

There are no doubts that our society is getting more mobile and international. Working and living in a different country every couple of years or even within a week for specific projects or business opportunities is becoming an almost innate part of our European life. Accordingly, our needs and perception of housing and organizing our daily life is changing. People tend to be less attached to one house and specific objects they do not use daily. Nowadays, sharing platforms go beyond Couchsurfing, AirBnB or Blablacar and sharing platforms for construction machines, garden tools or sustainable solutions are becoming very common. Not surprisingly, rental platforms for equipment are rising in the construction industry. Renting machinery solves the problem of unused big machinery sitting around the construction site and drives down the costs.

### Rentmas

Rentmas is the new marketplace for construction machines, where supply and demand meet. Just check the map and rent the right machine in your area. So you save time, money und work in a sustainable way.

[rentmas.it](http://rentmas.it)

### Nido

Agriculture 4.0 is now within everyone's reach. It is thanks to technology, big data, and Nido, the IoT

system that simplifies the management of cultivation plants developed on hydroponic systems. Until now, managing hydroponic cultivation required excellent know-how and a lot of experience, so much to be considered a very complex technique. Nido rethinks the way hydroponics is done by simplifying all management processes, making it accessible to everyone. Nido is a small device driven by powerful software, where every parameter of cultivation, such as climate values, mineral nutrition, water acidification, and all its parameters, can be managed by a simple application for Apple or Android mobile devices. No more clumsy remote controls or incomprehensible control panels, just ease of reading and management.

[nidopro.com](http://nidopro.com)

### Klarx

klarx is the leading rental service for construction site equipment in Germany. The startup compares construction equipment rental services to find the lowest price possible to create transparency in the otherwise untransparent construction site equipment market. By that, klarx manages to make rental process easier, faster and more cost-efficient. Founded in 2015, klarx today already counts over 250,000 available machines and a nationwide network of rental partners.

[klarx.at](http://klarx.at)





# Klimahouse Future Hub

Future  
and  
trends