

Focus:
sustainable
construction
and housing

Technik Radar 2023

What Germans think
about technology



A study by

 **acatech**
NATIONAL ACADEMY OF
SCIENCE AND ENGINEERING

 **Körber
Stiftung**



University of Stuttgart
ZIRIUS – Center for Interdisciplinary
Risk and Innovation Studies

Technik Radar 2023

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Data collection method

Between 4 September and 12 October 2022, 2,011 randomly selected, German-speaking persons aged 16 and over living in Germany were surveyed by telephone by INFO GmbH Markt- und Meinungsforschung. To increase representativeness, the collected data were compared with official statistics and weighted accordingly. The average duration of the interviews was 34 minutes. We compared a selection of these data with results from earlier surveys (24 June to 20 July 2021, 19 August to 17 September 2019 and 12 October to 22 November 2017).

Summary of results

About TechnikRadar

While technology is a key driver of innovation and at the same time a guarantor of prosperity in Germany, it also has the potential to help solve global challenges. But technology is also fundamentally changing every aspect of how we live, learn, work, consume, communicate and move around. And these changes are being met in part with scepticism, in part with approval. acatech – National Academy of Science and Engineering, the Körber-Stiftung and the Center for Interdisciplinary Risk and Innovation Research (ZIRIUS) at the University of Stuttgart conduct an annual analysis to investigate German attitudes in this area of potential conflict. Do Germans tend to associate technology in its various forms and applications with hope or unease? Which new technologies do they welcome and which do they reject? What conditions have to be met for people to be open to technological change?

TechnikRadar (Technology Radar) is a regular, nationally representative survey developed in line with social science standards and evaluated using empirical social research methods. As a long-term early warning system, it identifies any missteps in technological change in good time or indicates where there is a particular need for communication. At the same time,

TechnikRadar aims to support innovation processes so that products and technologies are in harmony with citizens' expectations. The results provide a sound basis for a debate around the significance of technical innovation, associated regulatory requirements and options for shaping future innovation.

TechnikRadar 2023 focuses on Germans' opinions about sustainable construction and housing. Today, this sector still accounts for 30 % of greenhouse gas emissions; it generates more than half of all waste, the renovation rate is low, and too little building redevelopment is carried out to conserve land. In many places the demand for housing cannot be met, which means there is a need for more and faster construction, while skilled workers and sustainable building materials are in short supply. The sustainable construction and housing goals set by policy makers aim to ensure that, by 2045, Germany's building stock will be sustainable, building operation will be energy-efficient and climate-neutral and land use will be consistent with biodiversity.

This booklet summarises Germans' main attitudes towards these issues. The full version can be downloaded from:

en.acatech.de/technikradar koerber-stiftung.de/en/projects/technikradar/

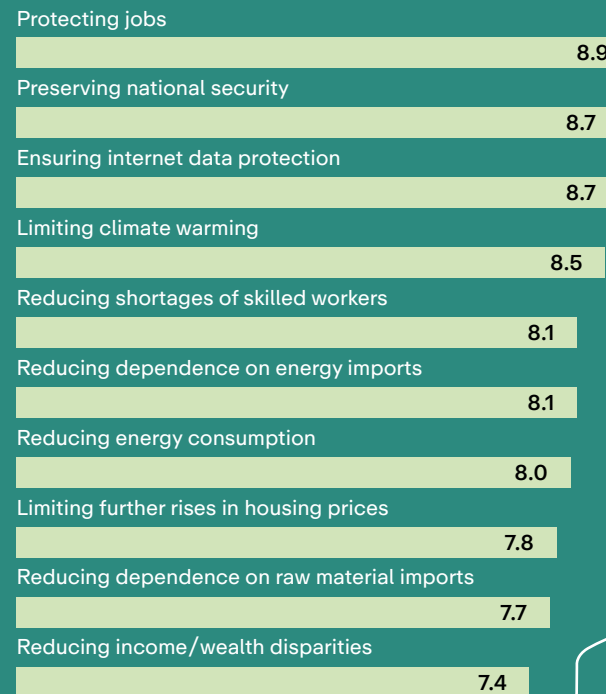
Most pressing issues for the future: protecting jobs still in the lead

The war in Ukraine, uncertainty in Europe and the threat of energy shortages were omnipresent in autumn 2022. Nevertheless, Germans' priorities on the most pressing issues for the future were largely unaffected by these factors.

Since the first survey, protecting jobs has consistently been ranked as the number one issue for the future – across all generations. An uncertain supply situation and rapidly rising energy prices notwithstanding, climate protection remains important, but has been pushed out of second place by issues such as national security and data protection. Limiting rises in housing prices, on the other hand, is in last place among the issues surveyed, being of above-average importance solely for women and low earners.

The importance of limiting global warming has remained the same in absolute terms compared to the last survey, but has slipped to fourth place for the middle (35–64) and oldest respondent groups (65+) behind preserving national security and data protection as the second and third most important issues for the future. Only for the younger group (16–34) does climate protection come second to protecting jobs, followed by data protection in third place and national security in fourth.

Germany's most important tasks for the future



Controversial technology: Germans want to have their say

More and more people are demanding a say on socially relevant issues. Many citizens would welcome being better informed by policy makers and being able to put forward their point of view more strongly and directly. When it comes to technological developments and, in particular, controversial technologies, there is a strong desire among the population for greater participation. This is also confirmed by TechnikRadar 2023: two thirds of Germans (66.8%) strongly agree or tend to agree with the statement “Citizens should be allowed to have a greater say in the future of controversial technologies” while a quarter (25.1%) are ambivalent and only 8.1% reject it.

There are significant differences within the population. While women and men differ only minimally on this issue, significant correlations with age, education and income are apparent. It is striking that older people in particular, as well as people with low levels of formal education and low household income are demanding greater participation. These are groups that tend normally to be under-represented in participation processes.

Citizens should have a greater say in the future of controversial technologies.

Household income > € 5,000



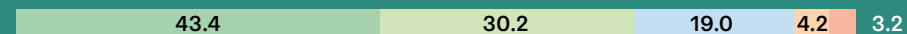
Household income € 3,000–5,000



Household income € 2,000–3,000



Household income < € 2,000



strongly agree tend to agree ambivalent tend not to agree do not agree at all



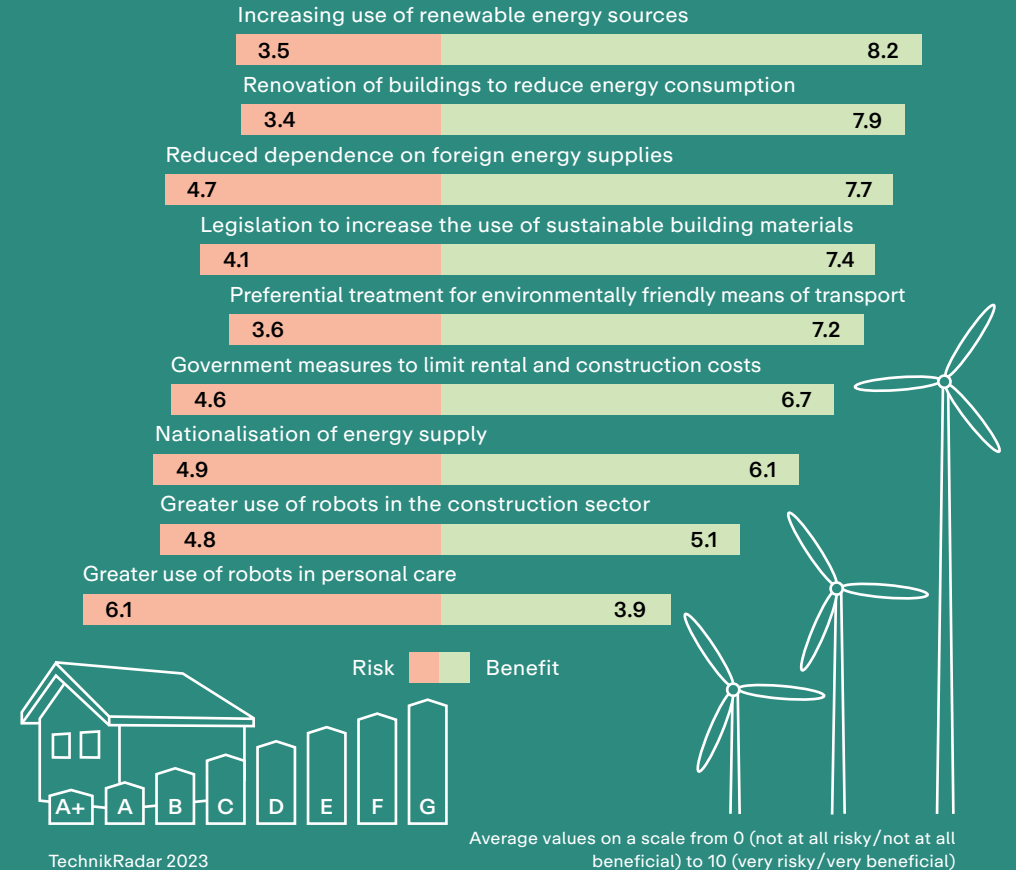
Assessment of technology trends: renewable energies beneficial, robotics risky

The current TechnikRadar asked respondents to assess the risks and benefits of new technologies. The increasing use of renewable energy is rated as the most beneficial measure. Only the benefits of building refurbishment are rated comparably positively. In contrast, respondents perceive robotics as carrying the greatest risk (in this case in relation to the construction and care sectors).

While the assessment of benefits is relatively uniformly distributed among the population, there are major differences in the perception of risks. In particular, women and those without a university degree generally give all measures a somewhat higher risk rating than do men and graduates; older persons also generally rate them as riskier.

Technologies directed towards a sustainable economy and an autonomous energy supply are rated as more beneficial than, for example, measures to nationalise energy supply. The population has a somewhat critical view of the increasing prevalence of robots: only care robots are perceived to involve a distinct net risk (the difference between the benefit and risk values, in this case -2.2), while for construction robots the benefits only slightly outweigh the risks (+0.3).

Assessment of benefits and risks of energy policy measures



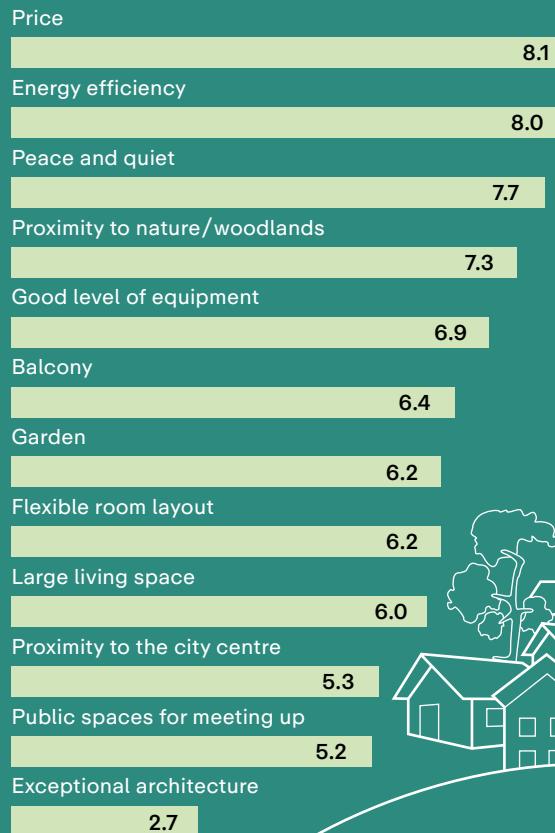
Despite urbanisation, a peaceful life in the countryside is still the dream of many

The affordability and, now, also the energy efficiency of housing are the most important factors for respondents, whether renter or buyer. Nevertheless, Germans' housing preferences remain surprisingly unchanged: a detached house in the countryside has been one of the most important status symbols for decades and remains the lifelong dream of many. The goals of urban infill development and renewed densification of cities do not fit well with Germans' preferences for living in a green and peaceful environment.

TechnikRadar 2023 confirms this, with “peace and quiet”, “proximity to nature” and “balcony” being of great importance to most people. Despite the steady move to large cities, the associated characteristics of “proximity to the city centre” and “public spaces for meeting up” rank lowest, irrespective of gender and income.

The age groups surveyed differ greatly in how they want to live: while 16 to 34 year olds attach particularly high value to price, public spaces for meeting up are of only below-average importance to them. Among the over 65s, however, such spaces and proximity to the city centre are rated as comparatively important. Short distances and neighbourly interaction are becoming more important in daily life.

Germans' residential preferences



Saving energy through behaviour change: heating and hot water come to mind for the majority

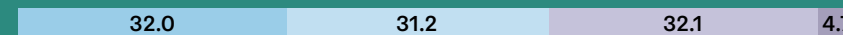
Tighter supplies and rising prices for oil and natural gas were of great concern to Germans during the survey period. In principle, 90 % of respondents see opportunities to make savings by changing their own behaviour. The majority, around one third, see heating and hot water as having the greatest savings potential. Savings in “mobility/travel” and “electricity consumption” come next.

One in ten, on the other hand, do not think they can save energy in any of the areas mentioned, these being disproportionately the over 65s. By contrast, only around 5 % of 16 to 34 year olds cannot see any savings potential in any area. But even if potential savings are seen, these amount to at most 10% for at least one in five. This is a statement made by almost one in two people in the 65 and over group when it comes to the sensitive area of heating.

While heating/hot water was mentioned as the area with the greatest savings potential, the average potential saving was estimated at 20.4 %, with a similar level for electricity consumption of 20.2 %. For mobility/travel, an average of 32.1 % was stated as a possible reduction in consumption.

Area with the greatest potential for savings through behavioural change

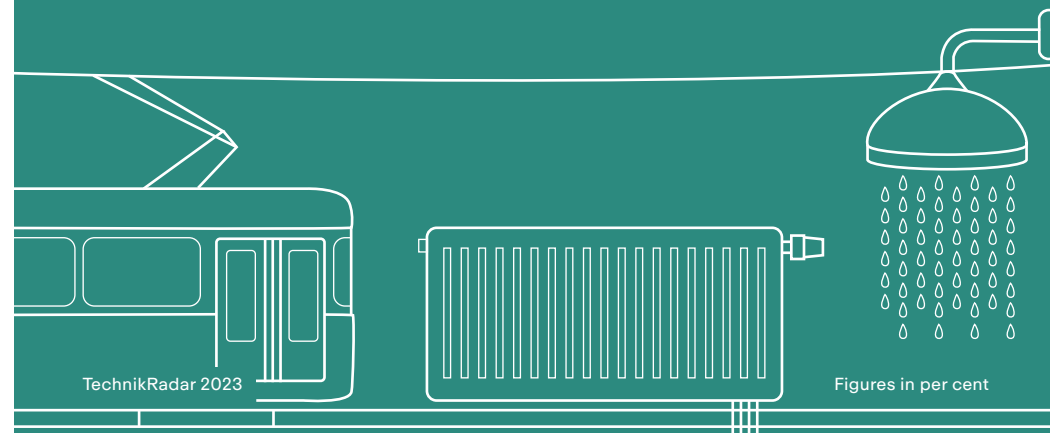
16–34 year olds



35–64 year olds



65 and over



Replacing old appliances: this is where real electricity savings can be made

Old appliances are often energy guzzlers and buying new appliances often pays for itself quickly. This makes them a proven way of permanently reducing energy costs in the medium term. Over 40 % of respondents consider that the greatest energy savings can be made by cutting electricity consumption through new appliances. In contrast, Germans' estimates of the efficiency of new appliances and their contribution to the "heating transition" are surprisingly low. However, one in five of the over 65s say they cannot save any energy at all with new appliances. This is twice as many as among 16 to 34 year olds.

On average, possible energy savings due to reduced electricity consumption through new appliances are estimated at 22.0 %. The perceived potential in this area is somewhat higher than for behavioural changes (20.2 %). In the heating/hot water area too, potential savings through new appliances are estimated to be higher than those through behavioural changes (26.9 % vs. 20.4 %). For mobility and travel, the reverse is true: here, the potential reduction in consumption through behavioural changes is considered greater than that through new appliances (32.1 % vs. 20.6 %).

Area with greatest energy saving potential through new appliances

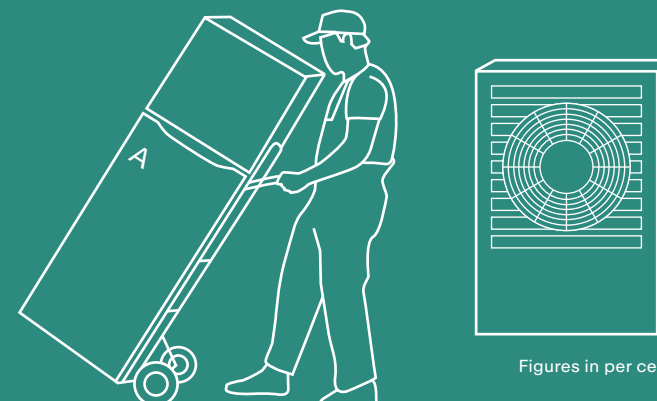
16–34 year olds



35–64 year olds



65 and over



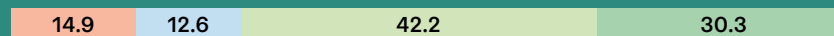
Budget for new appliances: an average of € 5,200 available over ten years

How much money could Germans invest in more economical appliances if the investment pays for itself after ten years? Our survey reveals that on average just under € 5,200 per person are available. However, the spread is very wide with almost one in four feeling unable to invest more than € 100 in new appliances and over half able to invest less than € 1,500. The spread in budgets reflects income inequality. This becomes particularly clear when comparing men's and women's assessments. At € 6,600 the budget for potential investment for men is almost twice that for women (€ 3,770). It is striking that for almost 15% of those who report household income of over € 5,000 per month, the amount available is less than € 100. On the other hand, 30.3% of respondents in this group indicate a possible investment of as much as in excess of € 10,000.

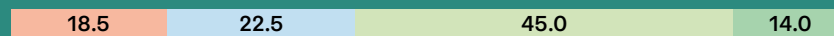
The budget available is clearly related to the area in which most energy can be saved, with those who mentioned electricity consumption indicating an average of € 8,560, which is distinctly higher than the rest.

Possible investment in appliances in the energy sector

Household income > € 5,000



Household income € 3,000-5,000



Household income € 2,000-3,000



Household income < € 2,000



Available amount for new appliances if the investment pays for itself in ten years



Many homeowners want to renovate: photovoltaics and solar thermal are the first choice

The majority of homeowners say they will undertake a renovation project in the near future, while only 21 % say they will not. Almost half (46 %) are planning to install a photovoltaic system as a first step and just under a third (32 %) want to equip their home with a solar thermal system. Almost as many (31 %) are planning minor upgrades such as new thermostats.

The greater the importance attached to limiting climate warming, the more frequently renovation measures are planned, in particular the installation of a photovoltaic system. Nevertheless, two thirds even of those who consider a reduction in global warming to be very unimportant are planning to do something. In the group which considers a reduction important this figure is 87 %.

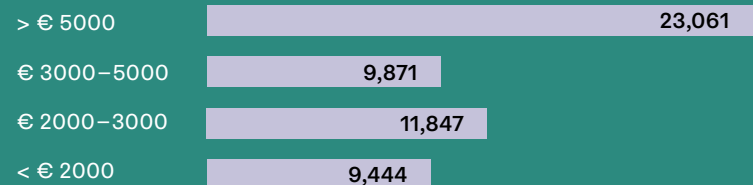
On average, homeowners say they have a budget of around € 13,250 for energy renovation measures which would pay for themselves within ten years. While those who consider limiting climate warming particularly important are more likely to plan renovation measures, they do not have a higher budget to do so. A quarter also said they could only invest less than € 500. Both figures are too little to be able to finance the costly planned measures.

Planned home investments in the energy sector

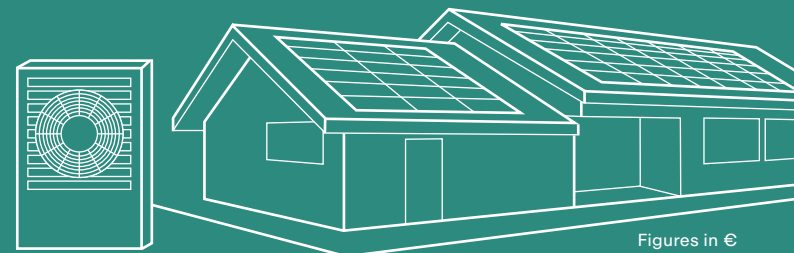
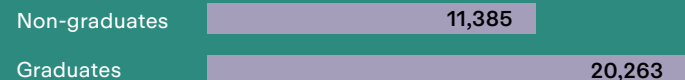
... by age



... by income



... by level of education



Rent increases due to renovation: the saved energy costs are decisive

The energy renovation of housing on the one hand reduces energy costs for tenants and on the other increases the value of the property for the owner. In addition, renovation may improve tenant comfort. However, there is an ongoing debate among policy makers and the public as to how much tenants should contribute to the renovation costs. This is why TechnikRadar 2023 investigated the extent to which tenants are willing to contribute to renovation costs if their own energy consumption falls as a result.

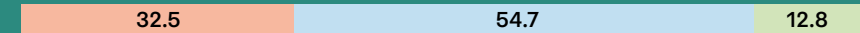
Half of the surveyed tenants would be willing to accept a rent increase in the amount of the energy costs saved following renovation. However, only 12.2% of respondents found an increase in rent greater than the saved energy costs acceptable, while around one third (37.7%) are only willing to contribute less to the costs of renovation than the saved energy costs. Willingness to contribute is slightly higher among graduates and those with particularly high household incomes.

Willingness of tenants to contribute to renovation costs

Household income > € 5,000



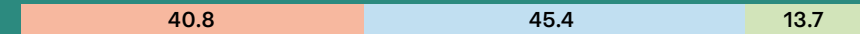
Household income € 3,000–5,000



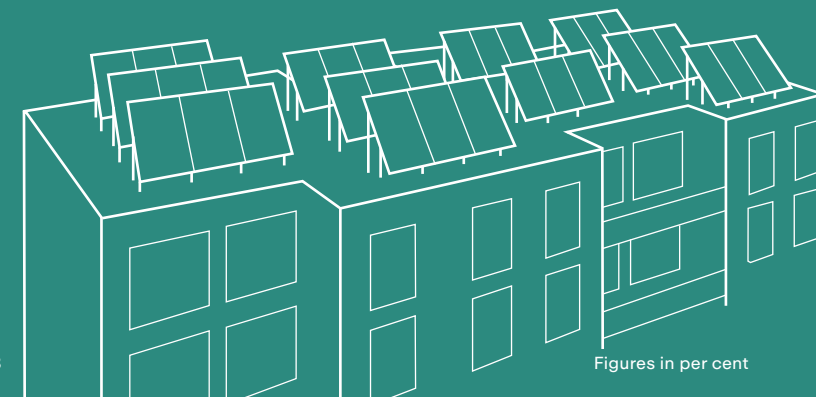
Household income € 2,000–3,000



Household income < € 2,000



Less than the saved energy costs Approximately the amount of the saved energy costs More than the saved energy costs



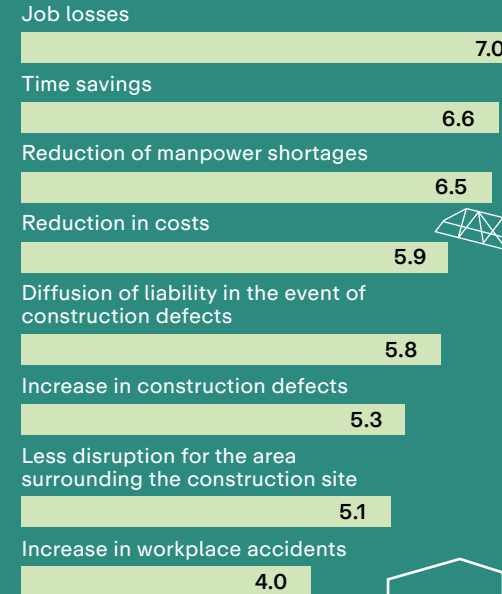
Robots to combat shortages of skilled workers: fear of job losses remains

In 2022, almost half of all companies reported staff shortages as having a negative impact on their business. Increasing digitalisation and new technical solutions promise to help here. Automation on building sites has huge potential. Entire houses have already been built using 3D printing technology.

On average, the consequences of using robots in construction were considered more likely to be positive than negative. In particular, respondents see benefits in reduced costs and shorter construction times, as well as a possible solution to the shortage of skilled workers. Nevertheless, concerns about job losses remain in the foreground, while an increase in workplace accidents is considered rather unlikely.

Higher income groups expect more highly automated construction processes to help solve housing shortages, primarily by reducing construction times and costs. Lower earners, in contrast, fear job losses from the use of construction robots.

Probable consequences of using construction robots



Average values on a scale from 0 (very unlikely) to 10 (very likely)

Digital transformation of the home: smart home appliances are making their way into the everyday lives of Germans

Smart home appliances intended to increase convenience in the home are becoming increasingly popular – not only app- or voice-controlled lighting and heating, but also autonomous robots which vacuum or mow are making their way into German households.

Compared to TechnikRadar 2018, the use of smart home technology among respondents in Germany has more than doubled: while 8 % reported using it in 2018, this figure has already risen to 21 % in the current survey. In particular, the proportion of women using it has roughly tripled since then across all age groups. Even among the otherwise less tech-savvy over 65s, around one in five say they use smart home appliances.

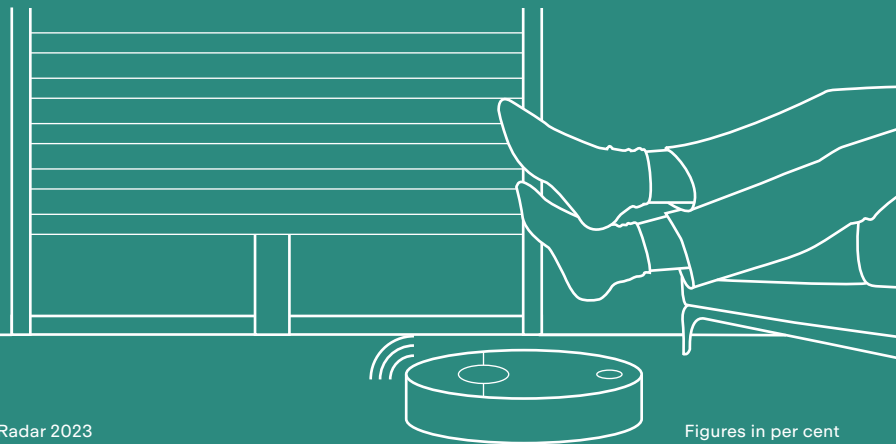
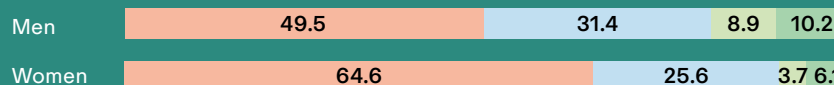
The primary benefit in all age groups is considered to be the hope of being able to live independently for longer in old age with smart home appliances and to increase security against burglaries. Together with “protection from hackers”, data protection is the top prerequisite for the use of smart home applications. Many respondents are nevertheless afraid of emerging vendor dependency and control by cybercriminals.

Use of smart home appliances

2023



2018



More convenient living in the smart city: there is a willingness to share data

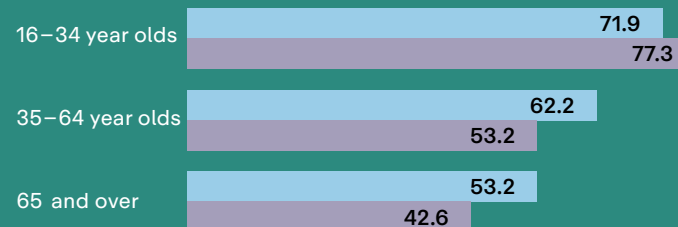
The ongoing digital transformation is awakening hopes for good connectivity between different areas of activity, for example better urban planning thanks to digital construction data.

So-called city dashboards are an important element of smart cities. These are intended to provide citizens, businesses and local authorities with a continuous insight into information on urban development, energy demand or the use of transportation services. More than half of respondents are very willing to share their data on energy consumption, building (e.g. year of construction, state of renovation, level of equipment) and/or mobility in anonymised form for this purpose. The picture was different in TechnikRadar 2022 in relation to health data, which are perceived to be more sensitive. Contrary to the trends in other age groups, women in the 16 to 34 year old group are more willing than men to share their data. And this is despite their interest in using it being almost ten percentage points lower than men's.

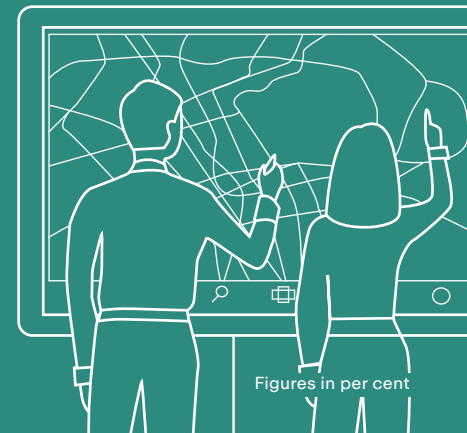
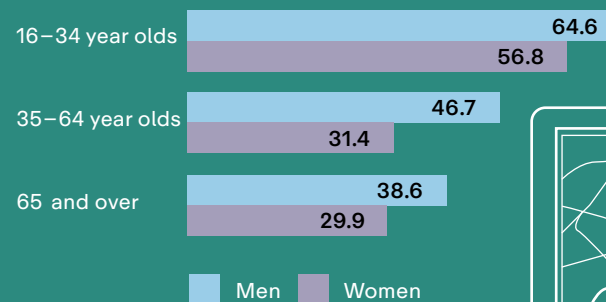
As might be expected, age also affects interest in use in this area. Interest declines sharply with increasing age: while 61% of 16 to 34 year olds would make use of such services, the figure is only 34% for the 65s and over.

Data sharing and the smart city

Would be willing to share energy data



Would like to use or view smart city services



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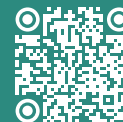
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This booklet summarises the key findings of TechnikRadar 2023 – Sustainable Construction and Housing. The full version and all previous issues of TechnikRadar can be obtained from:



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