



“Implications of ICT Development for Sustainable  
Development in a Global Perspective”

**ICT in affordable housing: Hamburg’s role in  
advancing Germany’s sustainability goals**

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# 1 Introduction

## Affordable housing & sustainability

- Significant and critical global challenge
- Provide households with access to suitable accommodation
- Sustainability principles (SDGs)

## Hamburg as a case study – key terms and impact

- Regulatory measures, collaborative initiatives, and ICT services
  - Green design
  - Energy management
- Balance between housing affordability and sustainability



# 2 Scope and Key Terms

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## Sustainable architecture and green design

- Sustainable architecture principles
- Five categories of sustainable architecture (energy, land, and material use, utilisation, waste management)
- Evolution of green design
- Benefits of green design Rising
- Rising importance of green design



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## SDGs and ICT services

- Principles of sustainable development
- Importance of the UN's SDGs
- Role of ICT in sustainable innovation
- ICT in affordable housing energy management
- ICT service architecture



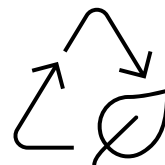
# 3 Sustainability Goals for Affordable Housing: Hamburg

## Background

- Housing market and rising rents
- Vulnerability to climate change
- Affordable housing initiatives
- Urban redevelopment and anti-gentrification measures

## Sustainability and commitments

- Sustainability cities frameworks
- Criticism of sustainable cities initiatives
- HafenCity and sustainable urban development
- Adaptive reuse and renewable energy
- Challenges with social equity



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## ICT services: the affordable housing options

- Smart metering systems and data awareness
- Adaptation of affordable housing needs
- Benefits for housing providers
- Environmental impact and sustainability goals

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## Applications and limitations of ICT services

- Remote energy resource management
- Real-time feedback
- Integration of renewable energy sources
  
- Technical expertise and engagement
- Internet access barriers
- Privacy and data protection concerns

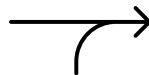


# 4 Research Methods

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## Applicability to other municipalities in Germany

- Integration of ICT for energy efficiency in housing
- Adoption of protective land policies
- Sustainable urban redevelopment models
- Multi-level governance for sustainable housing
- Community-based initiatives and inclusion

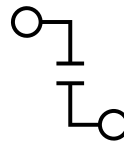


# 5 Findings

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## Gentrification and segregation through ICT services

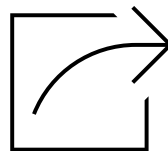
- Facilitation of gentrification by ICT and online real estate platforms
- ICT infrastructure and smart city technologies impact
- Digital divide and segregation
- Smart city initiatives favouring affluent residents
- Use of digital platforms for affordable housing
- ICT role in monitoring housing markets
- Combating social isolation and segregation with ICT



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## Transferability to other cities and municipalities in Germany

- Data sovereignty and management in cities
- Challenges in data utilisation
- Innovative data use cases
- Importance of data governance and legal frameworks



# 6 Conclusion

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- Complexity of affordable housing and sustainability integration
- Hamburg's innovative approach
- ICT services in affordable housing
- Collaborative data and policy initiatives
- Path forward: holistic approach for urban sustainability



# 7 References

- Altmann V., Skodzik, J., Golatowski, F., and Timmermann D. (2012). Investigation of the use of embedded Web Services in smart metering applications. *IECON 2012 – 38th Annual Conference on IEEE Industrial Electronics Society*, 6172 – 6177.
- Anderberg, S., and Clark, E. (2013). Green Sustainable Øresund Region: Or Eco-Branding Copenhagen and Malmö? *Urban Sustainability: A Global Perspective*, 591–610. Michigan State University Press. Doi: 10.14321/j.ctt130hjhm.27
- Alpopi, C., Iacoboaia, C., and Stănescu, A. (2014). Analysis of the current housing situation in Romania in the European context. *Transylvanian Review of Administrative Sciences*, 10(43), 5-24.
- Asongu, S., and Nwachukwu, J. C. (2018). Educational quality thresholds in the diffusion of knowledge with mobile phones for inclusive human development in sub-Saharan Africa. *Technological Forecasting and Social Change*, 129, 164-172.
- Baregheh, A., Rowley, J., and Sambrook, S. (2009). Towards a multidisciplinary definition of innovation. *Management Decision*, 47(8), 1323–1339.
- Boeing, G. (2020). Online rental housing market representation and the digital reproduction of urban inequality. *Environment and Planning A: Economy and Space*, 52(2), 449-468. Doi: 10.1177/0308518X19869678
- Broadbent, R. and Papadopoulos, T. (2012). Impact and benefits of digital inclusion for social housing residents. *Community Development*, 44(1), 55–67. Doi: 10.1080/15575330.2012.662990
- Bundesministerium des Innern, für Bau und Heimat (BMI, 2020). *Soziale Wohnraumförderung*. [The Federal Ministry of the Interior and Community. Social housing promotion.] [online] at: <https://www.bmi.bund.de/DE/themen/bauen-wohnen/stadt-wohnen/wohnraumfoerderung/soziale-wohnraumfoerderung/soziale-wohnraumfoerderung-node.html>, accessed January 28th, 2024.
- Chansomsak, S. (2008). *SUSTAINABLE ARCHITECTURE: ARCHITECTURE AS SUSTAINABILITY*. World Sustainable Building Conference (SB08). [online] at: [https://www.researchgate.net/publication/284878994\\_SUSTAINABLE\\_ARCHITECTURE\\_ARCHITECTURE\\_AS\\_SUSTAINABILITY](https://www.researchgate.net/publication/284878994_SUSTAINABLE_ARCHITECTURE_ARCHITECTURE_AS_SUSTAINABILITY), accessed July 10th, 2024.
- City of Cologne (2023). *Voluntary Local Review 2023 Cologne. Implementing the 2030 Agenda and the Sustainable Development Goals at the local level*. City of Cologne Office for Press and PR Work. [online] at: [https://www.stadt-koeln.de/mediaasset/content/pdf15/vlr\\_koeln\\_en\\_2023.pdf](https://www.stadt-koeln.de/mediaasset/content/pdf15/vlr_koeln_en_2023.pdf), accessed July 30th, 2024.
- Drewello, H., and Kulawik, N. (2022). Energiebunker Hamburg—Ecological and Economic Sustainability of a War Relic?. *Sustainability*, 14(1751). Doi: 10.3390/su14031751
- European Commission (1994). *Charter of European Cities & Towns Towards Sustainability*. European Conference on Sustainable Cities & Towns, Aalborg, Denmark. [online] at: [https://sustainablecities.eu/fileadmin/repository/Aalborg\\_Charter/Aalborg\\_Charter\\_English.pdf](https://sustainablecities.eu/fileadmin/repository/Aalborg_Charter/Aalborg_Charter_English.pdf), accessed July 20th, 2024.

European Commission (2011). *Hamburg - European Green Capital Winner 2011*. [online] at: <https://circabc.europa.eu/ui/group/c6e126de-5b8c-4cd7-8d36-a1978a2a63de/library/e303a1e3-ef88-4ba2-b2dc-9101ab9fcb69/details?download=true>, accessed July 20th, 2024.

Faludi, J. (2017). Golden Tools in Green Design: What Drives Sustainability, Innovation, and Value in Green Design Methods?. *Dartmouth Scholarship*, 2784. [online] at: <https://digitalcommons.dartmouth.edu/facoa/2784>, accessed July 10th, 2024.

Gabriel M., Jacobs, K., Arthurson, K., Burke, T., and Yates, J. (2005). *Conceptualising and measuring the housing affordability problem*. National Research Venture 3: Housing affordability for lower income Australians Research Paper No. 1, Australian Housing and Urban Research Institute.

German Federal Government (2021). *German Sustainable Development Strategy. Update 2021*. The Federal Government. [online] at: <https://www.publikationen-bundesregierung.de/resource/blob/2277952/1942518/63826d442b98410c951a10f431ab0330/deutsche-nachhaltigkeitsstrategie-2021-langfassung-englisch-download-bpa-data.pdf?download=1>, accessed July 23rd, 2024

Gibbs, D. (2000). Ecological modernisation, regional economic development and regional development agencies. *Geoforum*, 31(1), 9-19. Doi: 10.1016/S0016-7185(99)00040-8

Gissen, D. (2003). *Big and Green: Toward Sustainable Architecture in the 21st Century*, Princeton Architectural Press New York.

Haughton, G. (1999). Environmental Justice and the Sustainable City. *Journal of Planning Education and Research*, 18(3), 233–243.

Hiller, N. and Schultewolter, D. (2014). Quo vadis German Housing Policy. *Wirtschaftsdienst* 94, 34-40. Doi: 10.1007/s10273-014-1622-9

Hornborg, A. (2014). Urban Sustainability as Myth and Practice. In G. McDonogh, M. Checker, and C. Isenhour (Eds.), *Sustainability as Myth and Practice the Global City*. Cambridge: Cambridge University Press.

Hulchanski, D. J. (1995). The Concept of Housing Affordability: Six Contemporary Uses of the Housing Expenditure-to-income Ratio. *Housing Studies*, 10(4), 471-491. [online] at: [https://edisciplinas.usp.br/pluginfile.php/4138102/mod\\_resource/content/0/HULCHANSKI\\_1995\\_Concept-H-Affordability\\_Housing-Studies.pdf](https://edisciplinas.usp.br/pluginfile.php/4138102/mod_resource/content/0/HULCHANSKI_1995_Concept-H-Affordability_Housing-Studies.pdf), accessed March 31st, 2024.

Jonuschat, H., and Scharp, H. (2005). *Sustainable Home Services in Germany. An Overview on Preconditions, Frameworks and Offers*. IZT, Werkstattbericht Band 72, Berlin.

Jossin., J., and Peters, O. (2022). Sustainable Development Goals (SDG) indicators for municipalities: a comprehensive monitoring approach from Germany. *Journal of Urban Ecology*, 8(1). Doi: 10.1093/jue/juac020

- Jung, J. K., and Hiebert, T. (2019). Imagining the Details: Happy Places and Creative Geovisualisation. *Livingmaps Review* 7.
- Keil, R., and Desfor, G. (2003). Ecological Modernisation in Los Angeles and Toronto. *Local Environment*, 8(1), 27–44.
- Kenngott, G. F. (1912). *The Record of a City: A Social Survey of Lowell Massachusetts*. New York: Macmillan.
- Koebel, C., Lang, R., and Danielsen, K. (2004). *Community acceptance of affordable housing*. Virginia: National Association of Realtors, Virginia Tech Center for Housing Research and Metropolitan Institute. [online] at: [https://digitalscholarship.unlv.edu/sea\\_fac\\_articles/350](https://digitalscholarship.unlv.edu/sea_fac_articles/350), accessed March 31st, 2024.
- Landis, J. (2022). Urban regeneration meets sustainability - HafenCity, Hamburg. In: John Landis (Eds.), *Megaprojects for Megacities*, (13), 407-428. Edward Elgar Publishing.
- Lux, M. (2003). Efficiency and effectiveness of housing policies in the Central and Eastern Europe countries. *International Journal of Housing Policy*, 3(3), 243-265. Doi: 10.1080/14616710310001603712
- Martinez, E., Tommelein, I. D., and Alvear, A. (2017). Integration of Lean and Information Technology to Enable a Customization Strategy in Affordable Housing. In: Walsh, K., Sacks, R., Brilakis, I. (Eds.), *LC3 2017 Volume II – Proceedings of the 25th Annual Conference of the International Group for Lean Construction (IGLC)*, 95–102. Doi: 10.24928/2017/0136
- Martino, M., Guerrisi, A., Pastorelli, M., Tartaglia, M., Danov, S., and Renda, F. (2013). ICT top-level architecture and services for energy consumption management in social housing. *IECON 2013 - 39th Annual Conference of the IEEE Industrial Electronics Society*, 8148-8153.
- McMahon, M., and Bhamra, T. (2015). Social sustainability in design: Moving the discussions forward. *Design Journal*, 18(3), 367-391. Doi: 10.1080/14606925.2015.1059604
- Meredyth, D., Hopkins, L., Ewing, S., and Thomas, J. (2004). Wired High Rise: Using Technology to Combat Social Isolation on an Inner City Public Housing Estate. In: Marshall, S., Taylor, W., and Yu, X. (Eds), *Using Community Informatics to Transform Regions*, (13), 192-208. Idea Group Publishing.
- Middha, B., and McShane, I. (2022). E-gentrification: Digital Community Engagement, Urban Change and Digital Rights to the City. In: Hovik, S., Giannoumis, G.A., Reichborn-Kjennerud, K., Ruano, J.M., McShane, I., and Legard, S. (Eds.), *Citizen Participation in the Information Society*, 141-165. Doi: 10.1007/978-3-030-99940-7
- Milligan, V., Phibbs, P., Fagan, K., and Gurrán, N. (2004). *A Practical Framework for Expanding Affordable Housing Services in Australia: Learning from Experience*. Final Report No. 65. Melbourne: Australian Housing and Urban Research Institute. [online] at: <https://www.ahuri.edu.au/research/final-reports/65>, accessed March 31st, 2024.

Milligan, V., Phibbs, P., Gurran, N., and Fagan, K. (2007). *Approaches to Evaluation of Affordable Housing Initiatives in Australia*, National Research Venture 3: Housing affordability for lower income Australians Research Paper No. 7. Melbourne: Australian Housing and Urban Research Institute. [online] at: [http://www.ahuri.edu.au/publications/download/nrv3\\_research\\_paper\\_7](http://www.ahuri.edu.au/publications/download/nrv3_research_paper_7), accessed March 31st, 2024.

MOL (Mayor of London) (2004). *The London Plan: Spatial Development Strategy for Greater London*. London: Greater London Authority. [online] at: [https://www.london.gov.uk/sites/default/files/the\\_london\\_plan\\_2004.pdf](https://www.london.gov.uk/sites/default/files/the_london_plan_2004.pdf), accessed March 31st, 2024.

Nchofoung, T. N., and Asongu, S. (2021). ICT for sustainable development: Global comparative evidence of globalisation thresholds, *AGDI Working Paper, No. WP/21/061*. [online] at: <http://hdl.handle.net/10419/249072>, accessed July 10th, 2024.

Pittini, A. (2012). *Housing affordability in the EU. Current situation and recent trends*. Brussels: CECODHAS, European Social Housing Observatory.

Rees, W. E. (1997). Is 'Sustainable City' an Oxymoron?. *Local Environment*, 2(3), 303–310.

Richter, J. (2023). German housing policy and the current state of the housing market in Germany. *Sociedade e Território*, 35(1), 73-88. Doi: 10.21680/2177-8396.2023v35n1id32125

Rose, J., and Wilke, C. B. (2015). Climate change vulnerability in cities: The case of Hamburg, *HWWI Research Paper*, No. 167, Hamburg. [online] at: <https://www.econstor.eu/handle/10419/119458>, accessed July 20th, 2024.


Shahab, S., Hartmann, T., and Jonkman, A. (2020). Strategies of municipal land policies: housing development in Germany, Belgium, and Netherlands. *European Planning Studies*, 29(6), 1132–1150. Doi: 10.1080/09654313.2020.1817867

Schaefer, C., Stelter, A., Godefroid, M., and Niehaves, B. (2023). Exploring Citizens' Adoption of Sustainable Innovations Implemented by Cities and Municipalities in Germany. *Sustainability*, 15, 14203. Doi: 10.3390/su151914203

Scheller, D., and Thörn, H. (2018). Governing 'Sustainable Urban Development' Through Self-Build Groups and Co-Housing: The Cases of Hamburg and Gothenburg," *International Journal of Urban and Regional Research*, 42(5), 914-933. Doi: 10.1111/1468-2427.12652

Schlüter, K., Strelau, L., Hellwig, D., Herth, M., Schmitz, E., Constantini, R., and Wiegand, P. (2021). *Using Data to Shape our Future Cities. Digital sovereign cities – sustainable investments in data infrastructure*. Association of German Cities.

- Schmitt, C., and Palm, S. (2018). Sustainability at German Universities: The University of Hamburg as a Case Study for Sustainability-Oriented Organizational Development. In Leal Filho, W. (Eds.) *Handbook of Sustainability Science and Research. World Sustainability Series*. Springer, Cham. Doi: 10.1007/978-3-319-63007-6\_39
- Sepe, M. (2017). Placemaking, livability and public spaces. Achieving sustainability through happy places. *The Journal of Public Space*, 2(4), 63-76. Doi: 10.5204/jps.v2i4.141
- Starkey, M. (2010). *Sustainable for Whom? An Analysis of Housing Affordability in Proto-Sustainable Cities*. Simon Fraser University. [online] at: <http://summit.sfu.ca/item/9988>, accessed July 19th, 2024.
- Statistisches Amt für Hamburg und Schleswig-Holstein (2019). *Wohnen in Hamburg 2018. Durchschnittlich 40,0 m<sup>2</sup> Wohnfläche pro Kopf*. Nr. 156/2019. [online] at: [https://www.statistik-nord.de/fileadmin/Dokumente/Presseinformationen/SI19\\_156.pdf](https://www.statistik-nord.de/fileadmin/Dokumente/Presseinformationen/SI19_156.pdf), accessed July 21st, 2024.
- Statistisches Bundesamt. (2023a). *Number of inhabitants in Hamburg in Germany from 1960 to 2022*. Statista. [online] at: <https://www.statista.com/statistics/1107045/number-inhabitants-hamburg-germany/>, accessed July 21st, 2024.
- Statistisches Bundesamt (2023b). *Entwicklung der Durchschnittsmieten (nettokalt) nicht preisgebundener Wohnungen in Hamburg anhand des Mietenspiegels von 1995 bis 2023 (in Euro pro Quadratmeter)*. Statista. [online] at: <https://de.statista.com/statistik/daten/studie/1083988/umfrage/mietenentwicklung-in-hamburg-anhand-des-mietenspiegels/>, accessed July 21st, 2024.
- Steinacker, J. M., Van Mechelen, W., Bloch, W., Börjesson, M., Casasco, M., Wolfarth, B., Knoke, C., Papadopoulou, T., Wendt, J., Al Tunaiji, H., Andresen, D., Andrieieva, O., Bachl, N., Badtieva, V., Beucher, F. J., Blauwet, C. A., Casajus Mallen, J. A., Chang, J. H., Clénin, G., ... Rozenstoka, S. (2023). Global Alliance for the Promotion of Physical Activity: the Hamburg Declaration. *BMJ Open Diabetes Research and Care*, 9(3) Doi: doi.org/10.1136/bmjsem-2023-001626
- Steinhoff, B. (2024). The impact of the Euro on affordable residential construction in Romania in comparison to Croatia within the European Union. *International Journal of Multidisciplinary and Current Educational Research*, 6(4), 1-29.
- Stigler, G. J. (1954). The Early History of Empirical Studies of Consumer Behavior. *The Journal of Political Economy*, 57(2), 95–113.
- Sulimin, V., Shvedov, V. and Lvova, M. (2021). *Sustainable development principles: international aspect*. E3S Web of Conferences 295, 01056. Doi: 10.1051/e3sconf/202129501056



Syam, F. H., Wisdianti, D., Sajar, S., and Bahri, S. (2023). Study of sustainable architecture concepts. *International Journal of Research and Review*, 10(4), 419-424. Doi: 10.52403/ijrr.20230450

Throsby, D. (2001). *Economics and Culture*. Cambridge University Press.

Vogelpohl, A., and Buchholz, T. (2017). Breaking With Neoliberalization by Restricting the Housing Market: Novel Urban Policies and the Case of Hamburg. *International Journal of Urban and Regional Research*, 41, 266-281. Doi: 10.1111/1468-2427.12490

Warner, K. (2002). Linking Local Sustainability Initiatives with Environmental Justice. *Local Environment*, 7(1), 35–47.

WCED (1987). *Our Common Future*. United Nations. [online] at: [https://gat04-live-1517c8a4486c41609369c68f30c8-aa81074.divio-media.org/filer\\_public/6f/85/6f854236-56ab-4b42-810f-606d215c0499/cd\\_9127\\_extract\\_from\\_our\\_common\\_future\\_brundtland\\_report\\_1987\\_foreword\\_chpt\\_2.pdf](https://gat04-live-1517c8a4486c41609369c68f30c8-aa81074.divio-media.org/filer_public/6f/85/6f854236-56ab-4b42-810f-606d215c0499/cd_9127_extract_from_our_common_future_brundtland_report_1987_foreword_chpt_2.pdf), accessed July 19th, 2024.

Welfens, P., and Lutz, C. (2012). *Green ICT Dynamics: Key Issues and Findings for Germany*. EIIW Discussion paper, University Library Wuppertal. [online] at: <https://link.springer.com/article/10.1007/s13563-012-0017-x>, accessed July 21st, 2024.

Wiesemann, E. (2014). *From “Win-Win“ to “Lose-Lose” – How Neoliberalism Undermines the Sustainable City – A Case Study of Hamburg*. LUCSUS

Yuan, Q., and Tang L. Y. (2021). *The Principles in Green Design*. E3S Web of Conferences 259, 02002. Doi: 10.1051/e3sconf/202125902002



# Thank You for Your Attention

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Any Questions?

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