

# Smart Houses: Domotics Application to Reduce Energy Waste

A large, glowing lightbulb is the central focus, resting on a mound of dark soil. A small green plant with two leaves is growing out of the soil to the left of the lightbulb's base. The background is a dark, blurred green, suggesting foliage.

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Universidad Tecnológica Nacional – Facultad Regional Paraná

English II - 2022

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# I. INTRODUCTION

Home automation is used to:

- integrate technology in housing design.
- maximize people's life quality.
- improve about safety and comfort.
- promote a healthy environment.

## PURPOSE OF THE PRESENTATION

Inform about how home automation can help achieve the targets connected with the Sustainable Development Goals (SDG):

- SDG#3: Good Health and Well-being
- SDG#11: Sustainable Cities and Communities
- SDG#13: Climate Action



# MAP OF THE PRESENTATION

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## II. HOME AUTOMATION SYSTEMS' BASIC COMPONENTS AND OPERATION

- A. *Parts of a Home Automation System*
- B. *Energy Consumption*
- C. *Carbon Footprint Calculation*

## III. USING HOME AUTOMATION

- A. *Improved Well-Being*
- B. *Community cases with home automation*
- C. *Advantages and Disadvantages*



## II. HOME AUTOMATION SYSTEMS' BASIC COMPONENTS AND OPERATION

# HOME AUTOMATION SYSTEMS' BASIC COMPONENTS AND OPERATION

## *A. Parts of a Home Automation System*

### **Interconnected subsystems:**

- Temperature controls
- Lighting controls
- Security systems
- Audio-video subsystem
- Gates' control
- Data communication security

### **Home Energy Management System (HEMS) subsystems**

- Smart meter
- Communication devices
- Field devices
- Management devices

### **Semantic Smart Home System for Energy Efficiency (SESAME) subsystems:**

- Same subsystems as HEMS
- Turn-on and turn-off function in appliances



# HOME AUTOMATION SYSTEMS' BASIC COMPONENTS AND OPERATION

## *B. Energy Consumption*

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### Experimental low-cost setup based on STM32F407 microcontroller

- Carried out in a four-season geographical area
- Microcontroller devices:
  - Temperature sensor
  - Light dependent resistor
  - Smoke sensor
  - Solid state relay
  - Electric underfloor heating system
- Reduction in consumption by 15% after eight months of use



# HOME AUTOMATION SYSTEMS' BASIC COMPONENTS AND OPERATION

## *C. Carbon Footprint Calculation*

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### **Life Cycle Assessment (LCA)**

- This method is based on analyzing the effect of a product on the environment in its life cycle.
- The life cycle begins with obtaining the materials from nature.
- Results show that 99.4% of emissions occur during the assembly and use phase.
- The study is divided into 18 indicators.

# HOME AUTOMATION SYSTEMS' BASIC COMPONENTS AND OPERATION

## C. Carbon Footprint Calculation

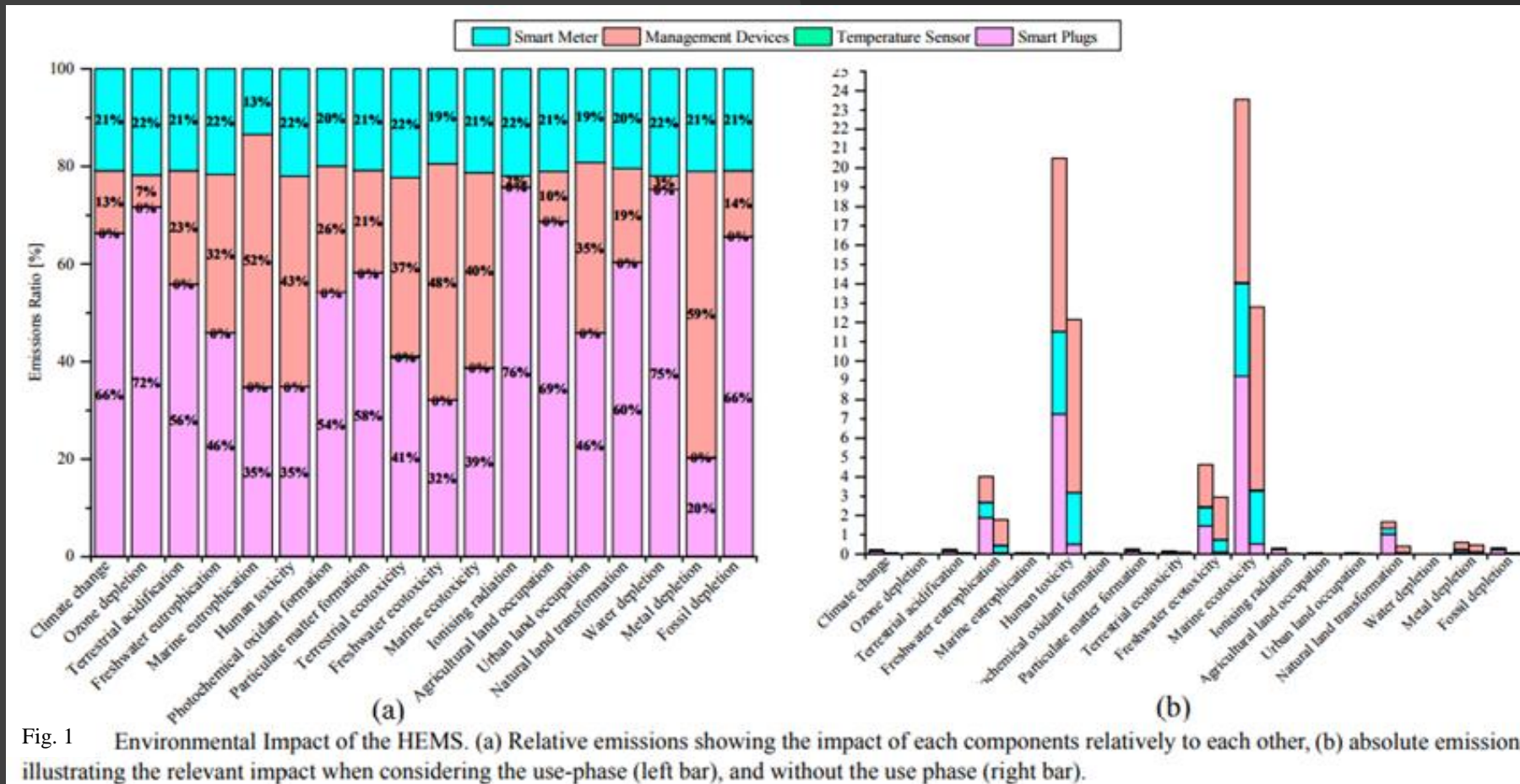
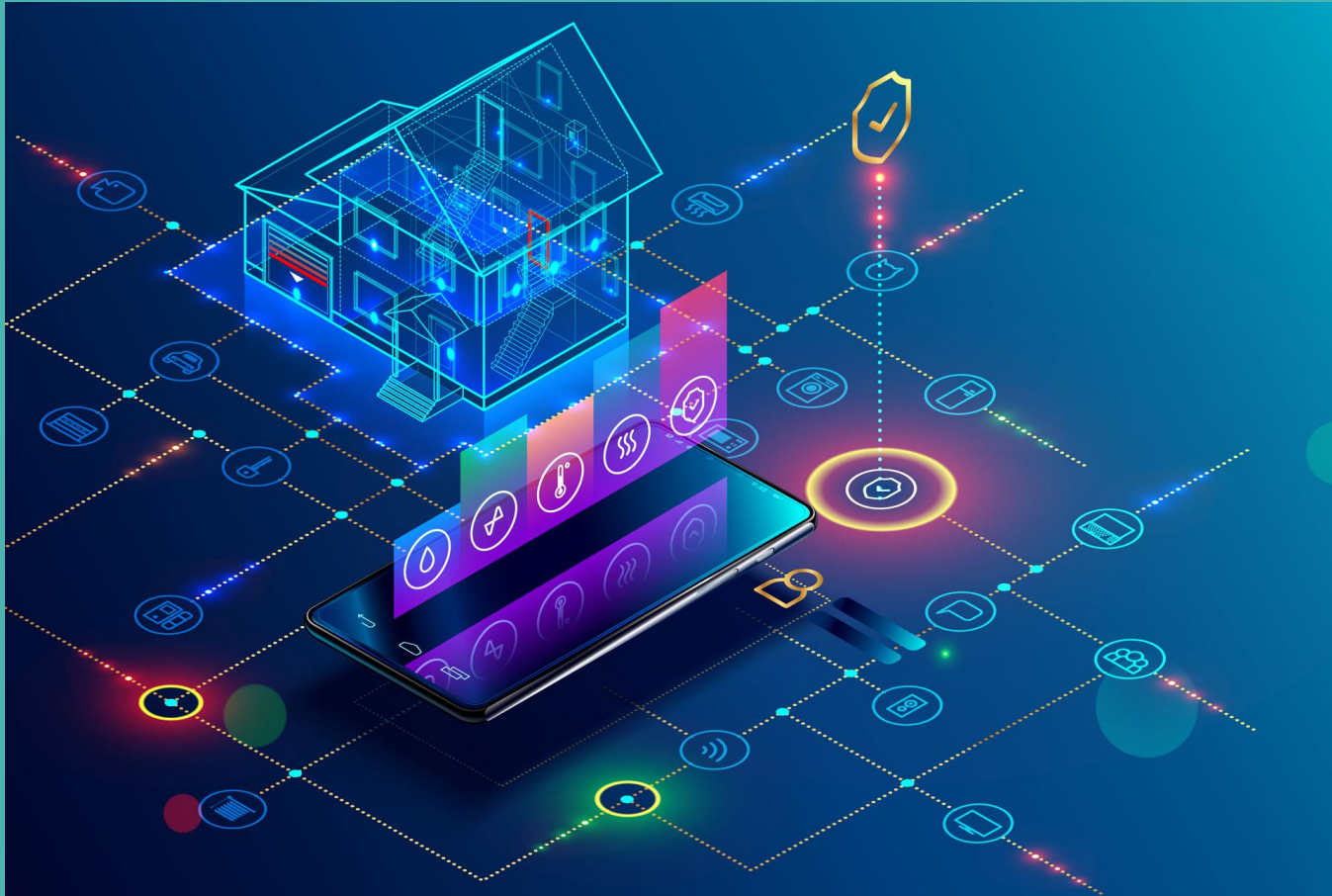


Fig. 1 Environmental Impact of the HEMS. (a) Relative emissions showing the impact of each components relatively to each other, (b) absolute emissions illustrating the relevant impact when considering the use-phase (left bar), and without the use phase (right bar).





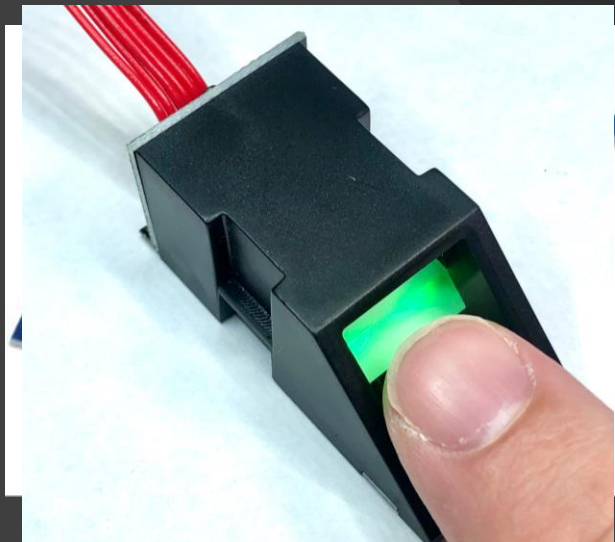
### III. USING HOME AUTOMATION

# USING HOME AUTOMATION

## *A. Improved Well-Being*

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- Main reason to use home automation
- Sensors used to provide safety



# USING HOME AUTOMATION

## *B. Community cases with home automation*

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### Chongqing, China



- 246 consumers participated in the study.
- The Chinese government launched measures such as promoting the use of efficient devices.
- The lack of knowledge about energy savings was the main issues.
- The problem of China could be addressed using automation.

# USING HOME AUTOMATION

## *B. Community cases with home automation*

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### **Västerås, Sweden**



- This study was carried out on a larger scale.
- Despite the improvement in the efficiency of elements, there is not a reduction in consumption.
- Smart meters were supposed to reduce consumption, but they did not help.
- The smart meters can help home automation devices providing information about the energy use and how to manage it.

# USING HOME AUTOMATION

## *B. Community cases with home automation*

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### Shanghai, China



- ❑ The study is based on the concept that the largest contributors to high carbon emissions is the building sector.
- ❑ 131 households participated in this study.
- ❑ A 12.9% reduction in standby consumption was reached.
- ❑ Once again, home automation has potential to reduce electricity consumption.

# USING HOME AUTOMATION

## C. Advantages and Disadvantages

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### Advantages

- Reduction in energy consumption
- Efficient energy management
- Improved lifestyle
- Security
- Safety

### Disadvantages

- It is difficult to change people's lifestyle
- Investment in home automation does not pay itself back in a short period of time





## IV. Conclusion



**Thank you!**



## REFERENCES

- **[1]** THE 17 GOALS | Department of Economic and Social Affairs.  
<https://sdgs.un.org/goals>.
- **[2]** N.L. Jean, A. Caló, K. Leiviska, E. Pongrácz, “Environmental impacts and benefits of smart home automation: Life cycle assessment of home energy system”. Conference paper, February 2015.
- **[3]** S. Matlak, R. Bogdan, “Reducing Energy Consumption Home Automation based on STM32F407 Microcontroller”. Conference paper, November 2016.
- **[4]** A. Bhati, M. Hansen, C. Chan, “Energy conservation through smart homes in a smart city: A lesson for Singapore households”. Informative Article, January 2017.

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