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The Impact of Climate Changes on the Strategic Plan for the Energy Sector in the West-Bank

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This thesis was submitted in partial fulfillment of the requirements for the Master's degree in Strategic Planning and Fundraising

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Thesis Approval.

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Declaration

I declare that all the work in this thesis titled “The Impact of Climate Changes on the Strategic Plan for the Energy Sector in the West-Bank.” has been done to fulfill the requirements for the degree of Master’s in Strategic Planning and Fundraising and submitted to Arab American University Palestine. All work is original, and it has been written by me and I have duly acknowledged all the sources of information have been used in this thesis.

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Dedication

To my mother, whose unconditional love and guidance have always been a source of strength and inspiration, teaching me the true essence of love and compassion.

To my father, may his soul rest in peace, whose wisdom, perseverance, and unwavering determination shaped my path and instilled in me the values of hard work and resilience.

To my life partner, my beloved wife, whose support, kindness, and steadfast companionship have been my anchor through every challenge and triumph.

To my children, the lights of my life, who have filled my days with joy, laughter, and boundless pride, reminding me of the beauty and purpose of life.

With all my love and gratitude

The Researcher

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The Researcher

Abstract

Electricity consumption in Palestine faces significant challenges due to environmental and economic factors. The study investigates the impact of heat-driven consumption patterns on the energy sector, particularly during peak demand periods in the central West Bank.

Using maximum variance sampling, the research examines the relationship between temperature and electricity consumption. Results indicate an average increase of 2.64% per degree Celsius during summer peak demand and 6.31% per degree Celsius during winter peak demand.

These findings contribute to operational planning for peak load management and inform strategic plans for distribution companies and the energy sector. The study highlights the need for adaptation strategies to address climate change impacts and ensure reliable electricity supply.

The research presented here underscores the critical role of strategic planning in mitigating the impacts of climate change on the energy sector. By understanding the relationship between temperature and electricity consumption, distribution companies and the energy sector can develop more effective strategies for managing peak demand and ensuring reliable electricity supply.

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Chapter 1

1-1 Introduction

Recently, the energy sector has been receiving local and global attention and growth, as it is considered a major factor in economic development and a basic requirement for the daily needs of the population, and electric energy constitutes an important part of this sector. Providing customers with energy in unusual weather conditions is one of the most important challenges for electric power transmission and distribution companies.

The World Meteorological Organization reported that climate change threatens energy security, as bad weather will lead to stress on electric power networks, a decrease in the reliability of the supply system, and an increase in energy demand at peak times, which requires the development of plans and strategies through which one can adapt to these climate changes.

The research will depend on consumption data and maximum loads of electric energy in the study areas in the middle of the West Bank and Jericho, analyze this data statistically, measure the impact of climate changes on it in previous and coming years, and contribute to proposals for developing strategies and policies for the Palestinian energy sector and distribution companies.

1-2 Research Problem

Energy distribution companies work to provide service to all citizens. Challenges appear when temperatures in the winter and summer seasons drop or rise significantly due to the operation of heating and cooling systems, which leads to disturbances in the energy supply due to severe and changing weather phenomena.

Climate change projections indicate that energy systems will be exposed to ever-increasing threats that have the potential to jeopardize the continuity and quality of supply. This leads us to the question: What is the best way to deal with the increased risk? A study about Climate change and residential electricity consumption in China by Yating Li, William A. Pizer, and Libo Wu. (2018) found that for colder days <7 °C, a 1 °C increase in daily temperature reduces electricity consumption by 2.8%. On warm days >25 °C, a 1 °C increase in daily temperatures leads to a 14.5% increase in electricity consumption.

The expected sharp temperature changes require knowing the percentage of load increases when temperatures drop or rise sharply in Palestine, which will contribute to adopting strategies that help mitigate climate impacts.

This research was conducted to answer the following main question: What is the climate change impact on the strategic plan of the Palestinian energy sector in the West Bank?

1-3 Research Significance and Justifications

Energy Policy: Understanding the impact of climate change on energy consumption and peak demand is essential for developing effective energy policies that can mitigate the impact of climate change.

Energy Security: Climate change can have a significant impact on energy security, particularly in regions that are vulnerable to extreme weather events. Understanding the impact of climate change on energy consumption and peak demand is essential for developing strategies to ensure a secure and reliable supply of energy in the face of climate change.

1-4 Research objectives

Main Research Objective:

To investigate the impact of climate change on the strategic plan of the Palestinian energy sector in the West Bank.

This objective directly addresses the main research question and provides a clear framework for the research study. It focuses on understanding the potential effects of climate change on the energy sector, which is crucial for developing effective adaptation and mitigation strategies.

The following sub-objectives

1- Studying the effect of temperatures on the peak demand for electrical energy and determining the relative weight of climate in the central West Bank.

2- Increase the share of renewable energy in the electricity mix to 45% by 2030.

3- Enhance the resilience of the electric power grid to climate change impacts.

4- Understanding the relationship between climate change and energy demand will contribute to determining policies aimed at reducing negative impacts.

1-4 Research Questions

The main research question is: What is the climate change impact on the strategic plan of the Palestinian energy sector in the West Bank?

The following questions branch out from the main research question:

1-What is the impact of temperatures on the peak demand and relative influence of climate for electrical energy in the central West Bank?

2- How can the integration of renewable energy into the electrical network be improved to 45% by 2035?

3- How can the grid be made more adaptable to changing climate conditions?

4- How does climate change relate to energy demand, and how can this understanding contribute to the development of policies aimed at mitigating negative impacts?

1-5 Develop Models

Develop models to predict the impact of climate change on electrical energy consumption and peak demand. These models can use historical data and climate change projections to estimate future trends and scenarios.

1- Evaluate Mitigation Strategies: Evaluate the effectiveness of various mitigation strategies to reduce the impact of climate change on electrical energy consumption and peak demand. These strategies may include energy efficiency measures, renewable energy deployment, demand response programs, and diversification of energy sources.

2- Communicate Findings: Communicate the findings of the analysis and modeling to stakeholders, including policymakers, utilities, and consumers, to inform decision-making and planning.

By following this methodology, it is possible to obtain a better understanding of the relationship between climate change, electrical energy consumption, and peak demand, and to develop effective strategies to mitigate the impact of climate change on the energy system. In terms of records of customer consumption and temperatures, data for the last years will be adopted.

1-6 Data collection tools

The researcher studied the effect of low and high temperatures on the maximum electricity consumption in the study areas. This period was chosen because it causes pressure on the electricity network and sometimes leads to an interruption in the supply of services.

Maximum variance sampling, also known as purposive sampling or extreme case sampling, is a type of non-probability sampling in which researchers intentionally select a single case that represents a broad range of phenomena. According to Alchemer (n.d., para. 2), "Maximum variance sampling is a type of non-probability sampling..." The researcher chose maximum variance sampling to study the effect of low temperatures or extreme weather conditions on maximum electricity consumption to obtain information about the factors that contribute to high electricity consumption under these conditions. Taking samples of the maximum consumption will help in managing the crisis by determining the value and percentage of the increase in consumption and taking proactive measures to manage and distribute electrical loads on the supply lines in optimal ways.

Study area: Jerusalem Electricity Company subscribers in the area

Jerusalem, Ramallah, Bethlehem and Jericho governorates

Sample volume:

Record numbers for total consumption, maximum loads and temperature

for several years.

1-7 Study limitations: The concept of the study and its temporal and spatial boundaries

The energy sector in the study means electrical energy distribution systems.

The study focuses on the period from 2018 to 2023, specifically examining the relationship between temperature and the maximum demand for electricity consumption during this period.

In terms of spatial boundaries, the study focused on the energy distribution areas in the Jerusalem Governorate Electricity Company.

The company's concession area currently amounts to approximately 25% of the area of the West Bank, equivalent to 366 square kilometers, distributed as follows:

East Jerusalem area: It includes 47 villages and towns and covers an area of 82 square kilometers.

Ramallah Region: It includes 72 villages and towns and covers an area of 174 square kilometers.

Bethlehem area: It includes 43 villages and towns and covers an area of 80 square kilometers.

Jericho area: It includes 7 places and covers an area of 30 square kilometers. The analysis will be conducted within these specific geographical areas to understand the impact of temperature on electricity consumption patterns.

Chapter 2

Important concepts about climate, Strategic Plan and energy

This chapter is considered an introduction to understanding the relationship between climate change and its impact on the maximum load of energy consumption and Strategic Plan Concepts.

2-1 Basics about climate change

The global ramifications of climate change, particularly its deleterious impact on basic human needs, have fueled a surge in international interest. Increased global warming, drought, and other manifestations have prompted intensified global efforts, manifested in numerous international conferences and forums aimed at coordinated responses to these multifaceted variables.

2-2 Definition of climate change

The most important concepts of climate change are:

2-2-1 Weather

As Ahlonsou et al. (2001) explain weather is the fluctuating state of the atmosphere, characterized by the temperature, wind, precipitation, clouds, and other weather elements. This weather is the result of rapidly developing and decaying weather systems such as mid-latitude low and high-pressure systems with their associated frontal zones, showers, and tropical cyclones. Weather has only limited predictability.

Mesoscale convective systems are predictable over hours only; synoptic-scale cyclones may be predictable over several days to a week. Beyond a week or two

individual weather systems are unpredictable.

2-2-2 Climate

Climate is not static, but dynamically fluctuates across both short-term (seasonal, annual) and long-term (decadal, millennial) timescales, responding to various internal and external forces.

2-2-3 Climate System

System consists of five major components: the atmosphere, hydrosphere, the cryosphere, the land surface, and the biosphere, forced or influenced by various external forcing mechanisms, the most important of which is the Sun. Also, the direct effect of human activities on the climate system is considered an external force. (Ahlonsou et al., 2001).

2-2-4 Climate Change

As the United Nations (2021) defines it, “Climate change refers to long-term shifts in temperatures and weather patterns.” These shifts can be natural, resulting from changes in the sun's activity or volcanic eruptions. However, since the 1800s, human activities have become the primary driver of climate change, mainly through the burning of fossil fuels like coal, oil, and gas.

When fossil fuels are burned, they release greenhouse gas emissions that act like a blanket around the Earth. These emissions trap the sun's heat and contribute to the warming of the planet. The main greenhouse gases responsible for climate change are carbon dioxide (CO_2) and methane (CH_4). CO_2 is released from activities such as driving cars using gasoline and heating buildings with coal. Deforestation and land use changes also release CO_2. Methane emissions primarily come from sources like agriculture, oil and gas operations. (United Nations, n.d., para. 2).

Several sectors contribute to greenhouse gas emissions and thus play a significant role in climate change. These sectors include energy, industry, transport, buildings, agriculture, and land use. Addressing emissions from these sectors is crucial in mitigating climate change and transitioning to a more sustainable future.

2-3 Causes of climate change

The main factor controlling the climate is solar radiation, and the variation in the amount of this radiation reaching any area with a different climate. Therefore, the climate can change for many reasons. There are many factors affecting radiation in the climate, so any of them can be a cause of climate change, even if they interact these factors together can be an additional cause of climate change and climate change may occur due to activity human and non-human activity.

Changing solar activity and volcanoes are considered among the most important causes of climate change due to non-human activity while increasing energy consumption is considered one of the most important human causes of climate change and is the focus of this study.

2-4 Manifestations of climate change

The most important manifestations of climate change are increasing temperatures, rising sea and ocean levels, declining ice at the poles, and changing the pattern of precipitation. (Cai et al., 2023).

Because some recent studies and research have indicated that temperatures are considered one of the most influential climatic variables on the total consumption of electrical energy, as for Middle Eastern studies, such as a study published in the journal International Journal of Climatology in 2023, concluded that temperature is the main factor affecting energy consumption in Egypt (Abdou et al., 2023) and another study published in the journal Energy Conversion and Management in 2022, concluded that temperature is the main factor affecting energy use in buildings in Jordan. (Al-Khawaja et al., 2022)

Therefore, the researcher will rely on the effect of temperatures as it is one of the most influential climate changes on electrical energy consumption.

2-5 Climate change in the Middle East and Palestine

Many reports issued by international institutions indicate that the countries of the Middle East are among the countries in the world most vulnerable to the accelerating effects of human-caused climate change, and resource-poor countries will suffer more severely, especially as annual rainfall decreases and turns into sharp and intense rainfall for short periods. This causes soil damage, deteriorates livelihoods in rural areas, and jeopardizes food security.

Climatically, the Palestinian territories are located in the transitional areas between the Mediterranean climate and the desert climate, so the climate is generally described as hot and dry in the summer and moderate and rainy in the winter. In the short winter, rain falls on all parts of the West Bank, but to varying degrees in quantity. Between the regions, in addition to the short winter season, there is also a long summer season, which is characterized by high temperatures and their variation from one region to another, between these two seasons, there are two transitional seasons, which are spring and autumn, as the hot and dry

winds blow in spring and autumn, be loaded with dust. (Mrai, 2018)

By reviewing the average temperatures in the study areas, such as in (Table 2-1), and the researcher's practical experiences in the field of control and load management for the electrical energy supplied to the study areas, it becomes clear that severe climate changes affect energy and this appeared in the summer and winter seasons only, while temperatures during the spring and fall seasons are considered moderate and there is often no need to operate cooling and heating systems.

Table 1Average temperatures during 2023 in the study areas. (Palestinian Meteorological Department, 2024)

City	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul	Aug.	Sep.	Oct.	Nov.	Dec.
Jerusalem	8.7	9.9	12.3	15.6	20	22.5	23.6	23.8	22.8	20.4	15.5	10.6
Ramallah	9	10.2	12.7	16.6	20	21.9	24.1	23.7	22.3	20.1	15.3	10.7
Bethlehem	10.1	10.8	13	16.8	20.6	23.9	25.2	25.5	23.2	21.3	16.2	11.6
Jericho	13.2	14.6	17.4	21.7	25.6	28.5	29.9	30	28.6	25.1	19.6	14.7

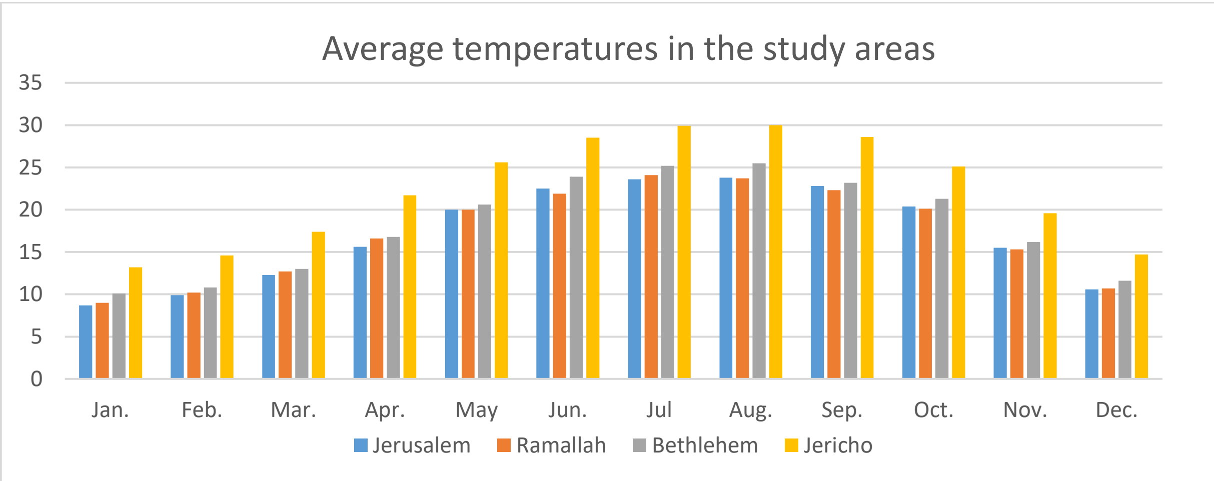

Figure 1 Average temperatures in the study areas

The occupied Palestinian territory, as part of the Eastern Mediterranean, is subject to many serious changes in annual rainfall, mean temperature, extreme weather events, and sea level rise as stated in the fourth assessment report by Intergovernmental Panel on Climate Change - IPCC.

A pronounced warming for the eastern Mediterranean is projected throughout this century. predict temperatures rise to 3.5ºC by the end of the century with warming stronger in the summer than the winter, while the JMA-AGCM model forecasts annual mean surface temperature rises for the region of between 2.6ºC (moderate climate sensitivity) and 4.8ºC (high climate sensitivity) for the region.

Future climate forecasts for the State of Palestine based on the emissions scenarios proposed by IPCC, if emissions of greenhouse gases lead to an increase in the global average temperature by more than 2°C, which is consistent with the requirements set by intergovernmental climate change organizations for the acute effects of climate change to diminish, then the temperature change will be as follows:

Temperature increase of ~1°C by 2025

Temperature increase ~1.5°C by 2055

Temperature increase of ~2°C before 2090 (Palestinian Authority, 2016)

- Strategic Plan Concepts, Components, and Types of Strategies

  Strategic Planning: A continuous process of defining an organization's goals, identifying strategies to achieve them, and allocating resources effectively (David, 2023).

  Vision: A clear and concise statement of an organization's desired future state (Pearce & Robinson, 2023).

Mission: A statement of an organization's purpose and reason for existence (David, 2023).

Strategic Objectives: Specific, measurable, achievable, relevant, and time-bound (SMART) goals that contribute to achieving the vision (Kotler & Keller, 2020).

Values: The core principles that guide the organization's actions and decisions.

Strategies: Actions or approaches that the organization will take to achieve its goals.

Tactics: Specific actions or steps that are taken to implement strategies.

Resources: The assets that the organization has available to achieve its goals, such as financial resources, human resources, and physical resources.

- **A strategic plan typically includes the following components**:

Executive Summary: A brief overview of the plan.

Situation Analysis: An assessment of the organization's internal and external environment.

Vision and Mission Statements: Statements of the organization's vision and mission.

Goals and Objectives: Specific goals and objectives that the organization wants to achieve.

Strategies: Actions or approaches that the organization will take to achieve its goals.

Action Plans: Specific steps that will be taken to implement the strategies.

Resource Allocation: The allocation of resources to implement the plan.

Evaluation and Monitoring: A process for evaluating the progress of the plan and making adjustments as needed.

2-6 Types of Strategies

There are many different types of strategies, but some of the most common include:

Growth Strategies: Strategies that focus on increasing the organization's size, market share, or revenue.

Stability Strategies: Strategies that focus on maintaining the organization's current position.

Retrenchment Strategies: Strategies that focus on reducing the organization's size or scope.

Innovation Strategies: Strategies that focus on developing new products or services.

Cost Leadership Strategies: Strategies that focus on reducing the organization's costs.

Differentiation Strategies: Strategies that focus on making the organization's products or services unique.

The type of strategy that an organization chooses will depend on its specific goals and objectives, as well as the competitive environment in which it operates.

2.6.1 The importance of strategic planning for the electric energy sector:

Ensuring Continuity of Electrical Power Supply:

- Strategic planning guarantees the provision of sufficient amounts of electrical energy to meet the increasing demand for it. This involves forecasting future electricity demand, identifying potential supply sources, and developing strategies to bridge any gaps between supply and demand. This can involve investing in new power plants, expanding existing ones, and diversifying the energy mix to include more renewable sources.

- Strategic planning helps develop renewable energy sources and reduce dependence on traditional energy sources. This is crucial for mitigating the environmental impacts of electricity generation and ensuring long-term energy security. Strategic plans should identify and prioritize the development of renewable energy sources, such as solar, wind, and geothermal, while also considering the necessary infrastructure and grid integration requirements.

- Strategic planning ensures improving the efficiency of electricity transmission and distribution networks to reduce losses and save energy. This involves investing in smart grid technologies, upgrading transmission and distribution infrastructure, and implementing demand-side management programs. By minimizing energy losses and optimizing network performance, strategic planning can contribute to a more reliable and sustainable electricity supply.

- Reducing costs:

  - Strategic planning helps choose the least expensive energy sources.

  - Strategic planning reduces losses in electricity transmission and distribution networks.

  - Strategic planning reduces the costs of maintaining and operating the infrastructure of the electric power sector.

The above can be summarized as follows:

- Developing strategic plans helps address the challenges posed by climate change to the electric power sector.

- Ensures the sustainability of the electric energy sector in the future.

- Contributes to achieving sustainable development goals.

2-6-2 Factors to consider when developing a strategic plan for the electric power sector in the Central West Bank:

The electric power sector in the Central West Bank faces a range of strengths, weaknesses, opportunities, and threats. The sector needs to exploit strengths and opportunities to develop itself and overcome weaknesses and threats. Through sound strategic planning, investment in renewable energy projects, and improved energy efficiency, the electric power sector in the Central West Bank can meet the growing demand for electric power and achieve sustainability.

Strengths and weaknesses of the electric power sector in the Central West Bank:

- Strengths:

Qualified human resources: The electric power sector in the central West Bank has qualified human cadres with experience in the field of generation, transmission and distribution of electricity.

Investments in infrastructure: The electric power sector in the central West Bank witnessed significant investments in infrastructure, which led to improved transmission and distribution networks.

Regional cooperation: The electric power sector in the central West Bank enjoys regional cooperation relations with neighboring countries, which allows the exchange of experiences and technologies.

Awareness of the importance of renewable energy: Awareness of the importance of renewable energy has increased in the central West Bank, which has led to increased investments in solar.

- Weak points:

Heavy reliance on the sources of the Israeli Electricity Company: The electric power sector in the central West Bank relies heavily on the Israeli supplier, which reduces the dependability and reliability of the system.

Lack of investments in some areas: More investments are still needed in some areas, such as energy storage and improving energy efficiency.

Political challenges The electric power sector in the central West Bank faces political challenges, such as the Israeli occupation, which limits the ability of the Palestinians to develop the energy sector.

High cost of electricity: The cost of electricity in the central West Bank is high compared to neighboring countries, which constitutes a burden on consumers.

External environment: opportunities and threats

- Opportunities:

Economic Growth: The Palestinian economy has witnessed remarkable growth in recent years, which leads to an increase in demand for electrical energy.

Infrastructure investments: There is a growing interest from international donors to invest in infrastructure projects in Palestine, including the electric power sector.

Technology development: The electric power sector is witnessing rapid technological developments, providing new opportunities to improve efficiency and reduce costs.

Environmental awareness: There is a growing awareness of the importance of protecting the environment, which prompts the sector to invest in renewable energy projects.

- Threats:

Climate changes: Climate changes lead to an increase in demand for electrical energy in the summer, which puts pressure on the electrical grid.

The Israeli-Palestinian conflict: The Israeli-Palestinian conflict leads to political and economic instability, which negatively affects the electric power sector.

High fuel prices: High fossil fuel prices lead to increased costs of generating electric power.

Competition from renewable energy sources: Renewable energy sources pose increasing competition to the traditional electric power sector.

Stakeholders: Needs and Expectations

The government, represented by the Energy and Environment Authority, in addition to energy distribution companies

Needs: Providing reliable and affordable electrical services, promoting economic development, protecting the environment.

Expectations: Commitment to international standards, effective management, transparency and accountability.

Investors:

Needs: lucrative returns, political and economic stability, good governance.

Expectations: Financial transparency, effective management, adherence to environmental and social standards.

- local community:

Needs: Reliable and affordable electrical services, job opportunities, economic development.

Expectations: environmental protection, participation in decision-making, transparency and accountability.

Customers: Needs: Reliable and affordable electrical services, excellent customer service, diverse energy options.

Expectations: high quality of services, quick response to complaints, adherence to environmental standards.

Employee’s Needs: Competitive salaries, career development opportunities, safe and stimulating work environment.

Expectations: appreciation and respect, participation in decision-making, transparency and accountability.

Non-governmental organizations:

Needs: protecting the environment, promoting sustainable development, accountability and transparency.

Expectations: Commitment to environmental and social standards, participation in decision-making, transparency and accountability.

International institutions:

Needs: Promoting economic development, environmental protection, accountability and transparency.

Expectations: Commitment to international standards, effective management, transparency and accountability.

Media: Needs: access to information, transparency and accountability.

Expectations: Commitment to professional standards, accuracy and impartiality, accountability and transparency.

- Academics:

Needs: Conduct research, cooperate with the private sector, contribute to developing the sector.

Expectations: Access to information, transparency and accountability, support for research and development.

Values and Principles:

- Value:

Integrity: Commitment to honesty and transparency in all dealings.

Responsibility: Take responsibility for all decisions and actions.

Respect: Respect all stakeholders, including employees, customers, investors, and government.

Justice: Treating all stakeholders fairly and equitably.

Sustainability: Commitment to meeting the needs of current and future generations.

- principles:

Customer Focus: Putting customers' needs first.

- Continuous improvement: Continuously striving to improve performance and efficiency.

Innovation: Encouraging innovation and developing new technologies.

Collaboration: Working with other stakeholders to achieve common goals.

Good Governance: Commitment to the highest standards of good governance.

Directing the strategic planning process:

These values and principles should guide the strategic planning process for the energy sector in the Central West Bank. All decisions and actions must be consistent with these values and principles.

Other important considerations for the strategic plan

1. Sustainability: The strategic plan must be consistent with sustainable development goals, including reducing greenhouse gas emissions, improving energy efficiency, and promoting renewable energy.

2. Flexibility: The strategic plan must be able to adapt to changes in weather, energy price fluctuations, and technological changes.

3. Risks: The strategic plan must identify potential risks that the energy sector may face due to climate variables when implementing strategies, and develop plans to mitigate these risks.

Risks can be clarified by analyzing potential risks, such as the risk of prolonged power outages due to variable weather factors, and the lack of sufficient financial resources to deal with weather changes affecting the reliability of the energy sector, and identifying strategies to mitigate these risks.

4. Resources: The strategic plan must be realistic in terms of the resources available to the energy sector to implement the strategies.

5. Time: The time frame for achieving goals must be realistic.

Note: The five factors must be integrated and interconnected to ensure the success of the strategic plan.

2-7 Energy Sector

2-7-1 Definition

The energy sector refers to the industry and infrastructure involved in the production, distribution, and consumption of energy. It encompasses a wide range of activities related to various forms of energy, including fossil fuels (such as oil, natural gas, and coal), renewable energy sources (such as solar, wind, and hydropower), and nuclear energy. The sector involves the extraction or generation of energy resources, their conversion into usable forms, and the transportation and distribution of energy to end-users. Additionally, the energy sector includes the development and implementation of technologies, policies, and strategies to ensure a reliable, efficient, and sustainable energy supply.

2-7-2 Palestinian Energy Sector

The Palestinian territories have been under Israeli occupation since 1967, and have been divided into different administrative regions. According to the 1995 Oslo II Agreement, the West Bank and Gaza Strip were divided into Areas A, B, and C. In Area A, the Palestinian National Authority has full civil and security control. In Area B, the Palestinian Authority has civilian control but shares security control with Israel. In Area C, Israel has full civil and security control. This division has implications for the Palestinian electricity system.

In the West Bank, Area A covers 18% of the total land area, while Area B covers 22% and Area C 60%. Israel's control of Areas B and C significantly hinders the development of energy system infrastructure and poses challenges to political and regulatory development initiatives.

Consequently, the energy sector in Palestine presents unique challenges compared to other countries in the region. These challenges include a lack of natural resources, an unstable political environment, the current economic crisis, and high population density (Juaidi et al., 2016). Additionally, Palestine relies heavily on imported fossil fuels and electricity, primarily sourced from neighboring Israel. The physical division of Palestine into the West Bank (including East Jerusalem) and the Gaza Strip further complicates the energy sector, leading to unstable and unreliable electricity supply. These disruptions significantly impact the daily lives of the Palestinian population.

The energy sector in Palestine consists of three sub-sectors: electricity, energy, and energy efficiency. The hydrocarbon sector (gas and oil) is supervised by the General Petroleum Corporation.

The energy sector in Palestine differs from its counterparts in neighboring countries in several aspects.

The most important of which is the clear impact of the current political situation represented by the continued Israeli occupation.

For Palestine, which hinders the implementation of most of the Palestinian government’s development plans. This sector suffers from the inability to exploit local energy sources and the lack of financial resources necessary for the development of the private sector in the field of local energy production, in addition to its lack of availability geographical communication between the two parts of the country (the West Bank and the Gaza Strip). (Prime Minister's Office, 2021).

2-8 Strategic Plan for Energy Sectors

Creating a strategic plan for energy sectors requires a comprehensive approach encompassing various factors and considerations. Here's a breakdown of key components and aspects to include: Vision and mission, strategic objectives, strategic initiatives, performance measurement and monitoring and Strategic Initiatives.

2-9 The Palestinian electrical system

Palestine relies mainly on energy imports from Israel, with smaller imports from Egypt and Jordan. The Gaza power plant also contributes to the energy supply. However, Palestine currently lacks a national generation system that can adequately meet the present and future energy needs of its population.

To address this issue, the Palestinian Council of Ministers approved the establishment of the National Electricity Transmission Company in 2013. This government-owned company plays a crucial role in meeting the growing energy demands through diverse sources, aiming to achieve energy provision diversification. It also focuses on organizing the technical and financial

relationships between local and imported energy sources and distribution companies. (Palestinian Electricity Transmission Company [PETL], n.d.)

In terms of distribution, electricity is distributed from northern regions to central regions, with the Jerusalem Governorate Electricity Company responsible for distributing energy to southern regions. In some areas, energy distribution is still managed by municipal and local councils.

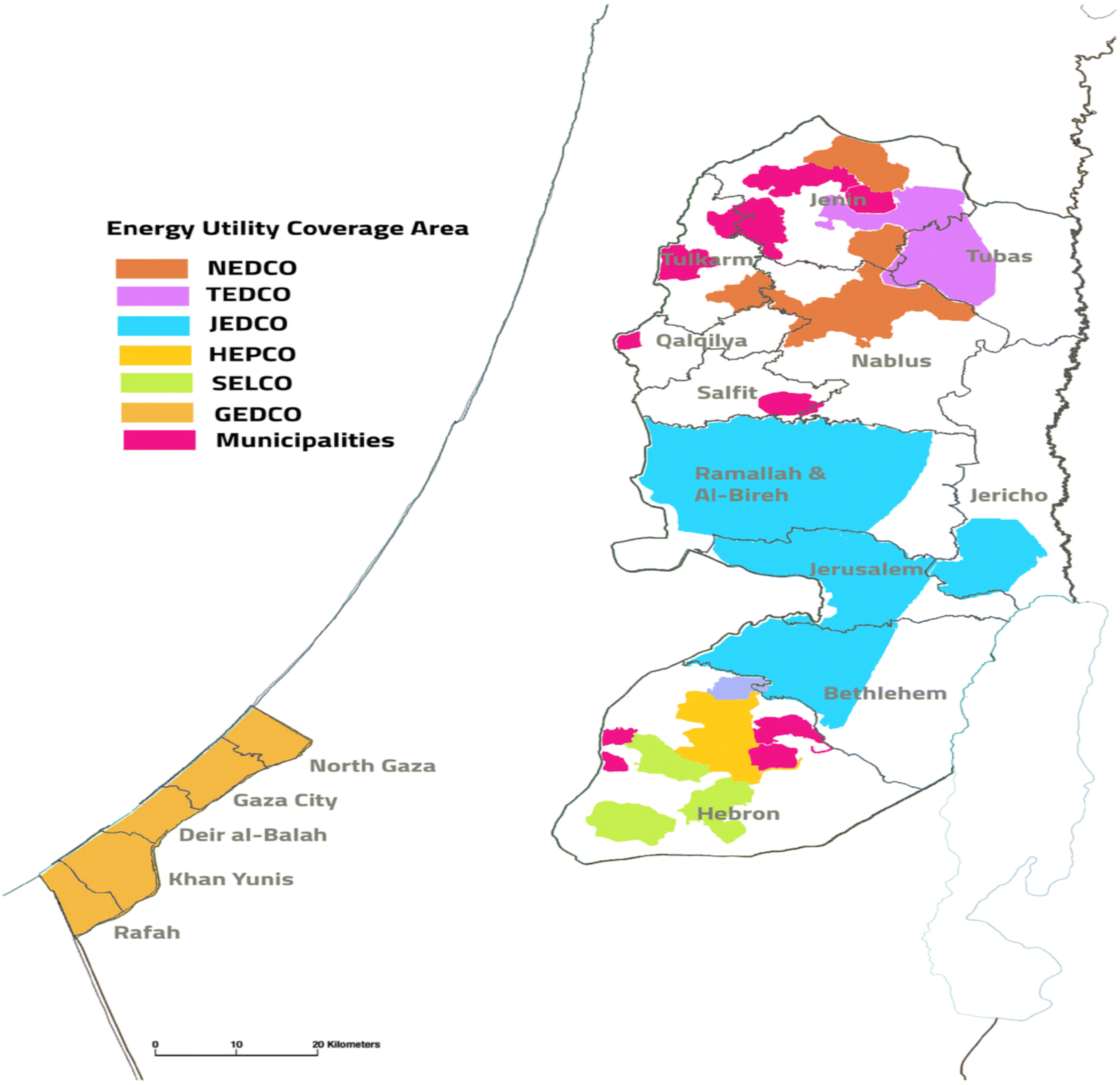

Figure 2 Mapping electricity distribution and municipalities according to their coverage area. (Kaldi & Sunikka, 2020)

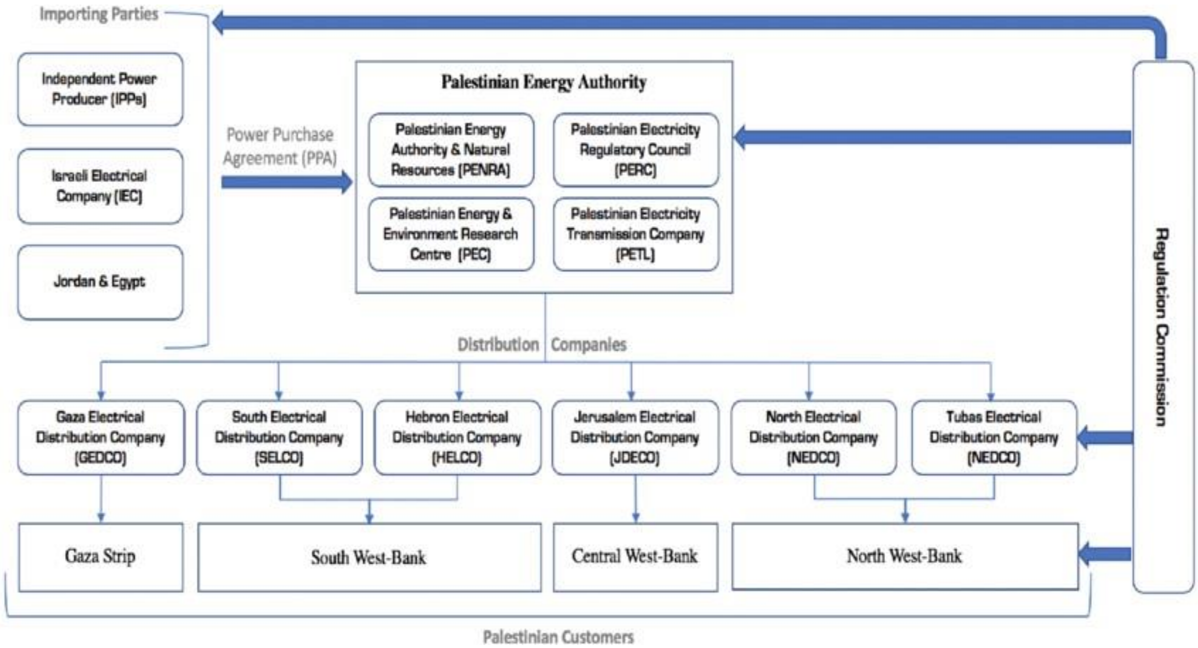

Figure 3 shows the structure and location of distribution companies. (Khaldi & Sunikka-Blank, 2020)

Due to various factors such as limited resources, political constraints, and the division of the territories, the Palestinian electrical system faces several challenges. These challenges include inadequate infrastructure, frequent power outages, high energy costs, and dependence on imported electricity.

Efforts are being made to improve the electrical system in Palestine. This includes investments in renewable energy sources such as solar and wind power, as well as collaborations with international organizations and neighboring countries to enhance electricity supply and reliability.

Despite these efforts, there is still a need for further development and modernization of the electrical system to meet the growing demand for electricity and ensure a sustainable and reliable energy supply for the Palestinian population.

2-10 Strategic plans for the Palestinian energy sector

A long-term national vision of the energy sector has been adopted, responding to demographic changes and increasing energy demand, as well as the need for economic and industrial development. This vision provides for the building of a comprehensive, integrated Palestinian national energy system capable of securing energy from its multiple sources so that it is secure and sufficient to meet the needs of sustainable, inclusive development (United Nations Environment Programme [UNEP], n.d.) within the following determinants:

- Increasing the share of renewable energy in the energy mix to 50% by 2035.
- Reducing dependence on Israeli electricity imports.
- Promoting energy efficiency in all sectors.
- Developing domestic energy resources, such as solar and wind power.
- Strengthening the institutional and regulatory framework for the energy sector.

It is important to highlight that research plays a key role in advancing the goals of an energy sector strategy aimed at building a secure energy system. This is achieved by anticipating energy demand during extreme climate changes and recommending policies to mitigate the challenges arising from such climate fluctuations.

2-11 Impact of climate change on the energy sector

The influence of climate change on the energy sector is substantial and varied. The sector faces challenges in energy production, distribution, and consumption due to increasing global temperatures, unpredictable weather events, and shifting climate patterns.

The most important impacts of climate change on the energy sector can be summarized as follows:

Disruptions in Energy Production: Climate change can disrupt conventional energy production methods. For instance, hydropower generation may be impacted by changing precipitation, while thermal power plants might encounter efficiency issues in higher temperatures.

Emphasis on Renewable Energy: Climate change underscores the importance of sustainable energy sources. The focus on renewable energy, such as solar and wind power, becomes imperative for minimizing environmental impact and ensuring a stable energy supply.

Vulnerabilities in Infrastructure: Energy infrastructure is susceptible to extreme weather events like hurricanes, floods, and wildfires, which can damage critical components, leading to service interruptions.

Fluctuations in Energy Demand: Temperature variations influence energy demand. Higher temperatures may increase the use of cooling systems, affecting electricity demand, while colder temperatures can spike the need for heating, impacting energy consumption.

Policy and Innovation Responses: The impact of climate change necessitates adaptive policies and innovative solutions within the energy sector. Collaborative efforts between governments, industries, and communities are essential to develop resilient infrastructure, promote energy efficiency, and transition to low-carbon technologies.

Comprehending and addressing the ramifications of climate change on the energy sector is vital for constructing a sustainable, resilient, and environmentally conscious energy future.

2-12 The impact of climate change on the energy sector in Palestine

Climate change is expected to lead to an increase in demand for electricity in Palestine, as people use more air conditioning and heating to cope with extreme weather events.

This will put a strain on the electricity grid, which is already under pressure due to the Israeli occupation.

2-13 The impact of climate change on the energy sector in the Central West Bank

The energy sector in the Central West Bank is significantly impacted by climate change. The region is witnessing changes in temperature, rainfall patterns, and extreme weather events, which have consequences for energy production, transportation, and consumption.

A key challenge is the increased demand for energy due to fluctuating temperatures. This places strain on energy production and distribution systems. Moreover, extreme weather events can cause damage to energy infrastructure, leading to power outages and disruptions.

Renewable energy sources, such as solar power, are also affected by climate change. Variations in temperature and rainfall patterns can impact the efficiency and output of these sources, resulting in reduced energy production.

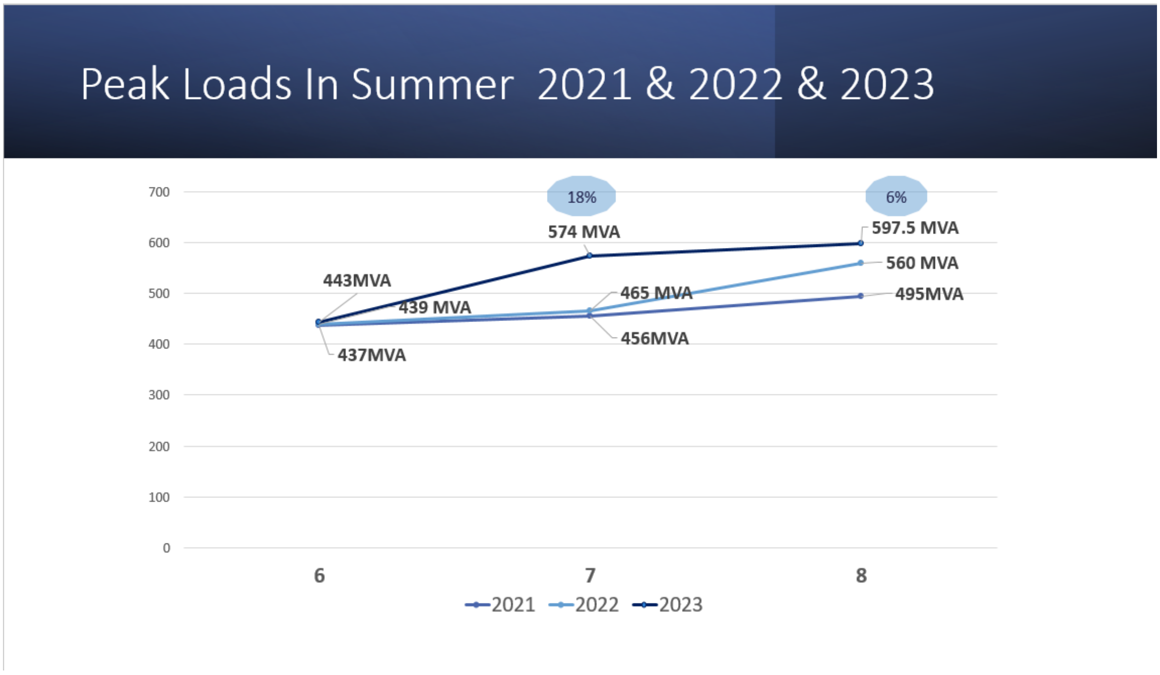

Figure 4 show the increase in maximum loads and monthly energy consumption during the recent summer seasons and Differences between Summer and Winter in Peak Loads.

Percentage of increase: 18%,6%

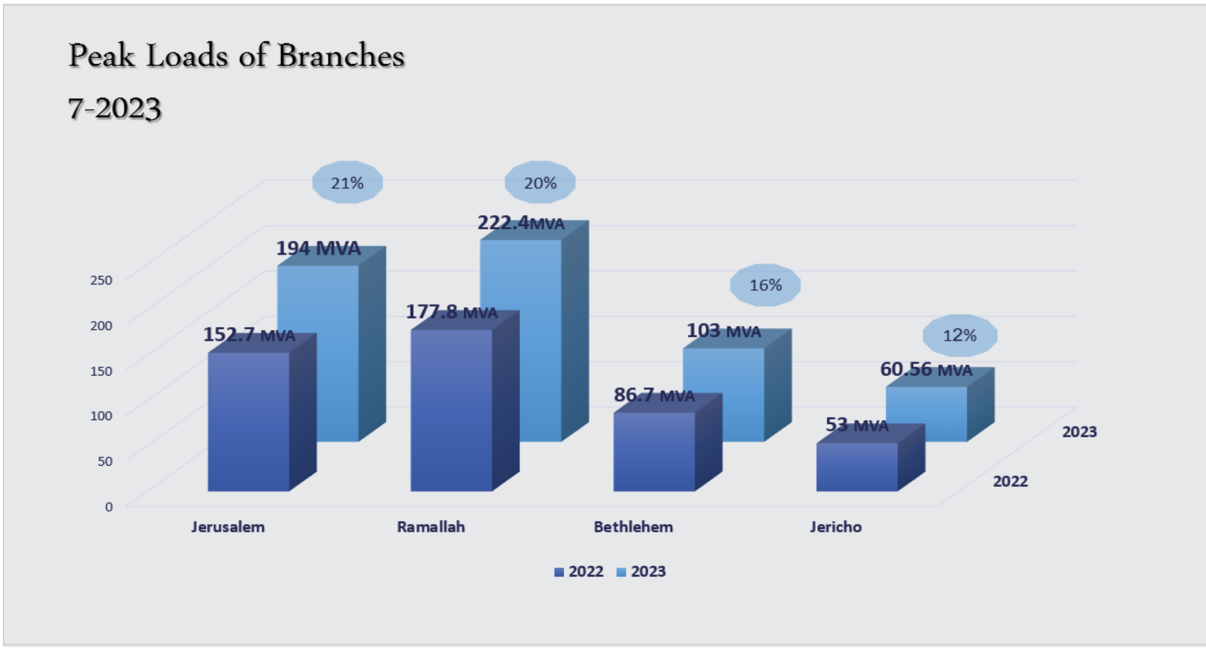

Figure 5 Peak Loads of Branches 7-2023

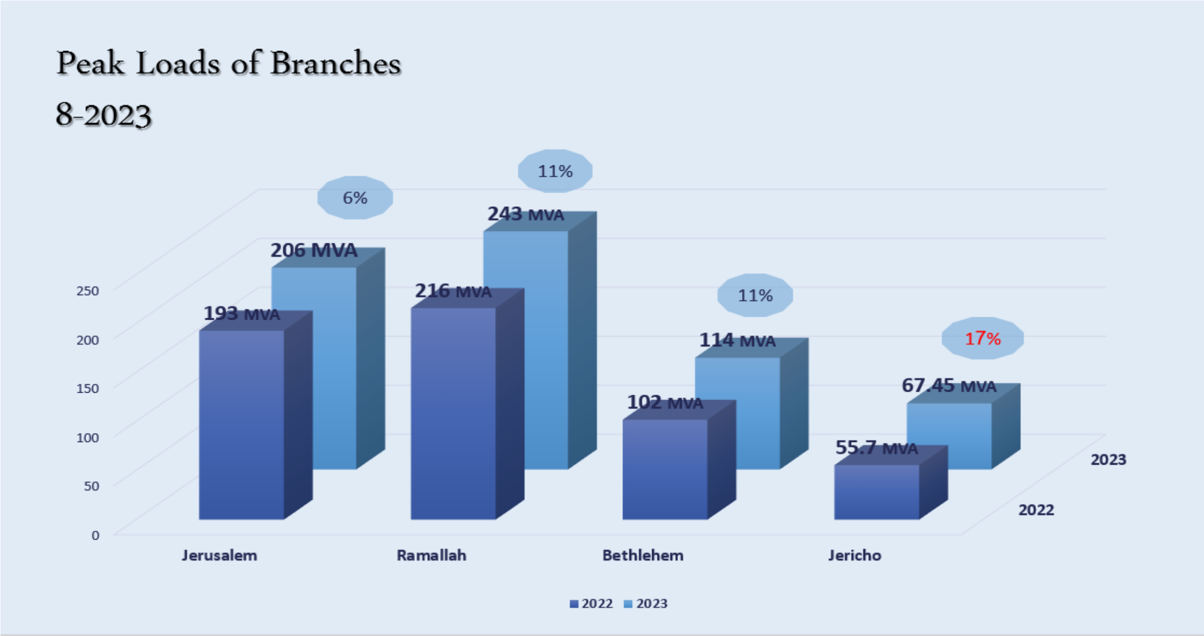

Figure 6 Peak Loads of Branches 8-2023

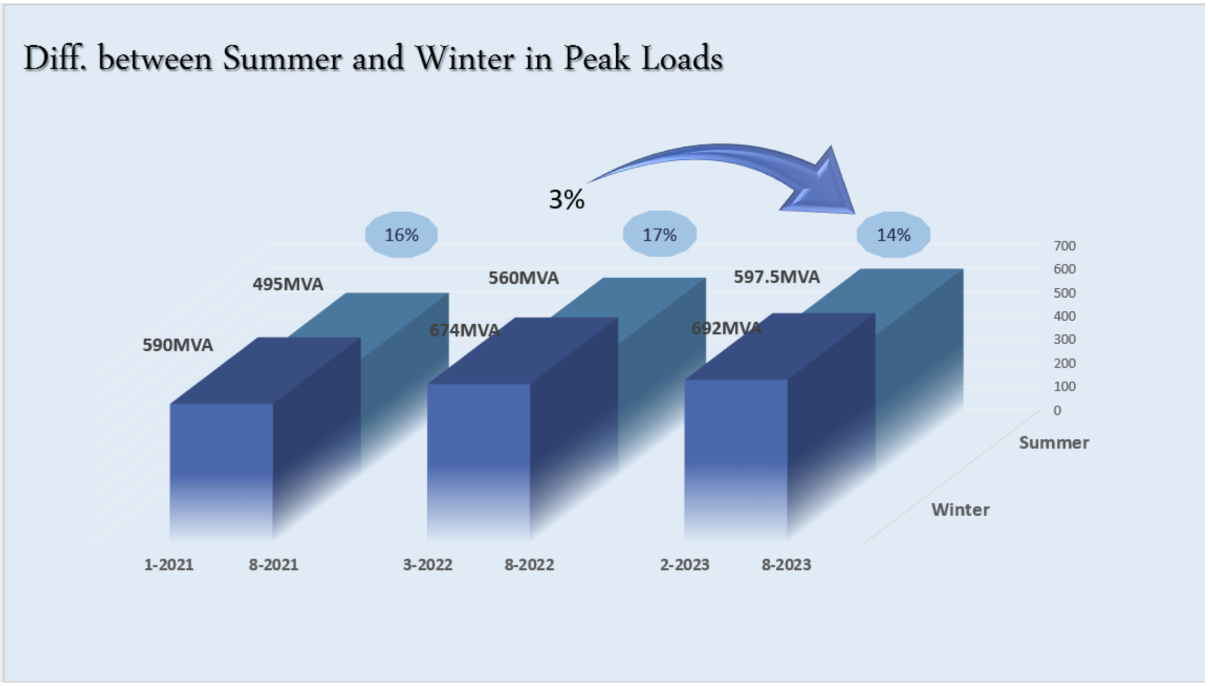

Figure 7 Diff betwen Summer and Winter in Peak Loads

2-14 The impact of climate change on the energy sector in Jericho

Jericho is located in the northern Jordan Valley region of the West Bank, and is one of the hottest areas in Palestine. Temperatures in Jericho are characterized by hot, dry summers and mild winters. Figure (2-8) (Palestinian Meteorological Authority, 2018) shows the average temperature during the years preceding 2018 and its comparison with 2018, as it clearly appears that temperatures rose throughout 2018 compared to previous years, and table (2-2) as temperatures appear to rise annually which requires more consumption of electrical energy during the summer for cooling.

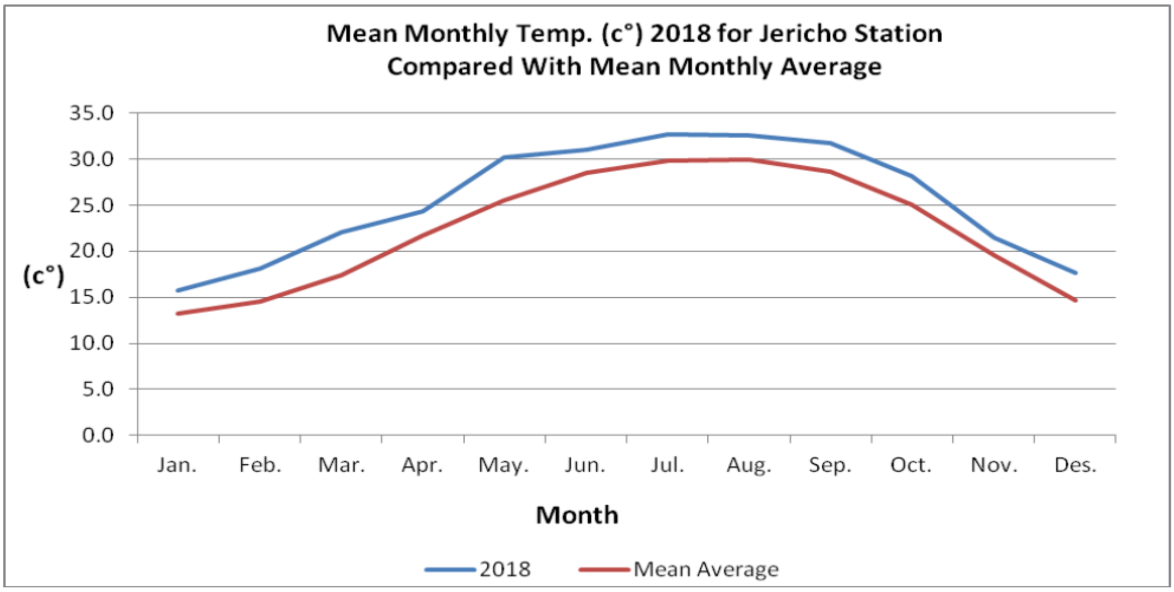

Figure 8 Mean Monthly Temp

Average annual temperature (°C) in Jericho

Table 2 Average annual temperature (°C) in Jericho

Year	Average annual temperature (°C)
2018	21.8
2019	22.4
2020	22.9
2021	23.4
2022	24
2023	24.5

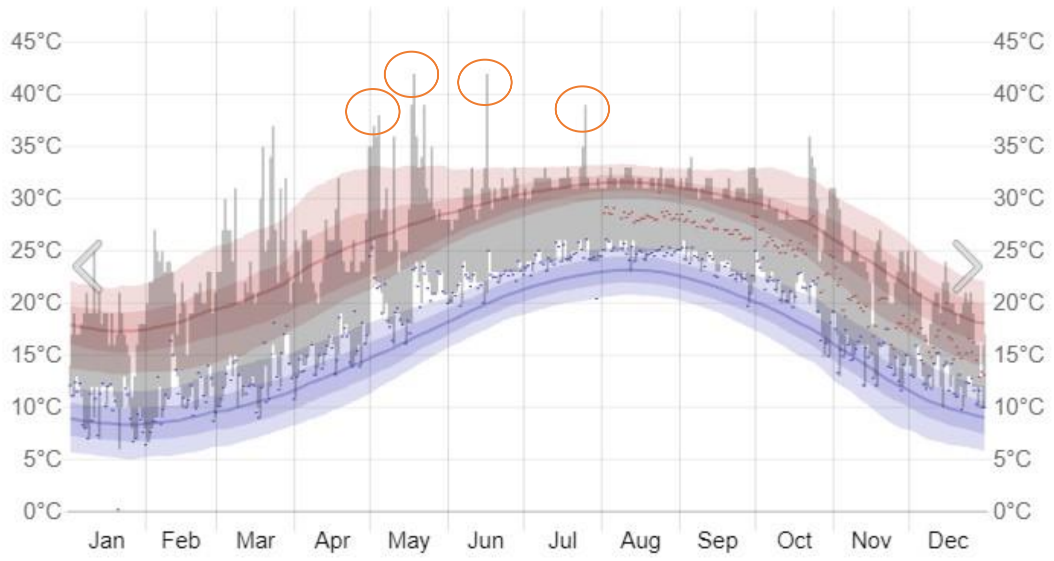

Figure 9 Temperature history in 2018 in Jericho

The daily range of reported temperatures (gray bars) and 24-hour highs (red ticks) and lows (blue ticks), placed over the daily average high (faint red line) and low (faint blue line) temperature, with 25th to 75th and 10th to 90th percentile bands.

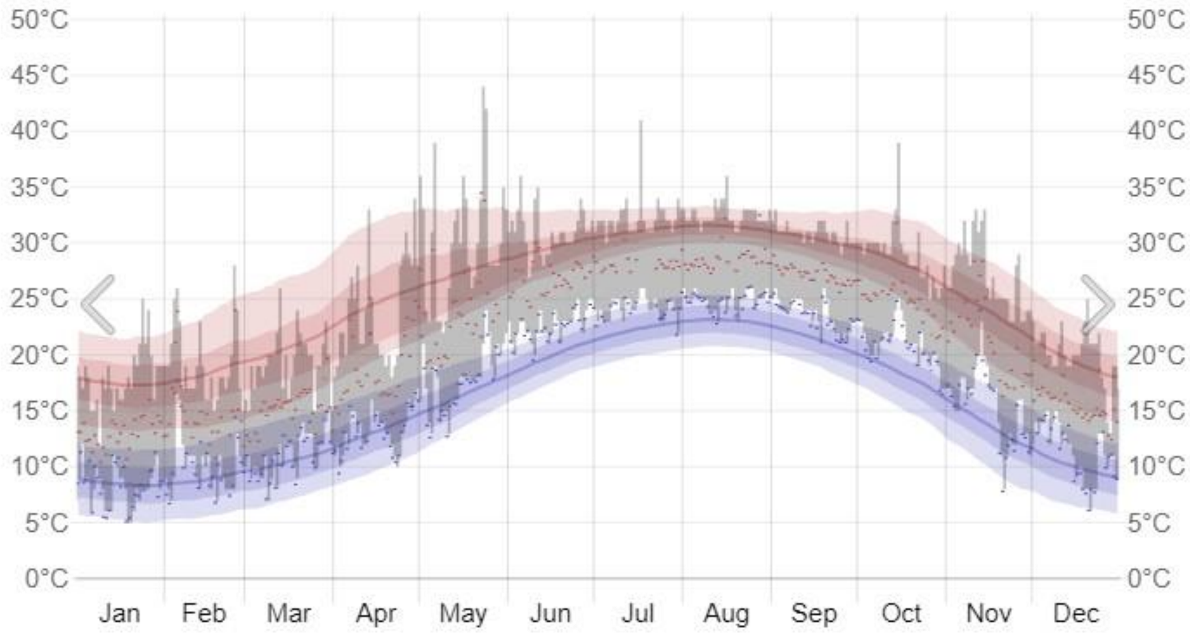

Figure 10 Temperature history in 2019 in Jericho

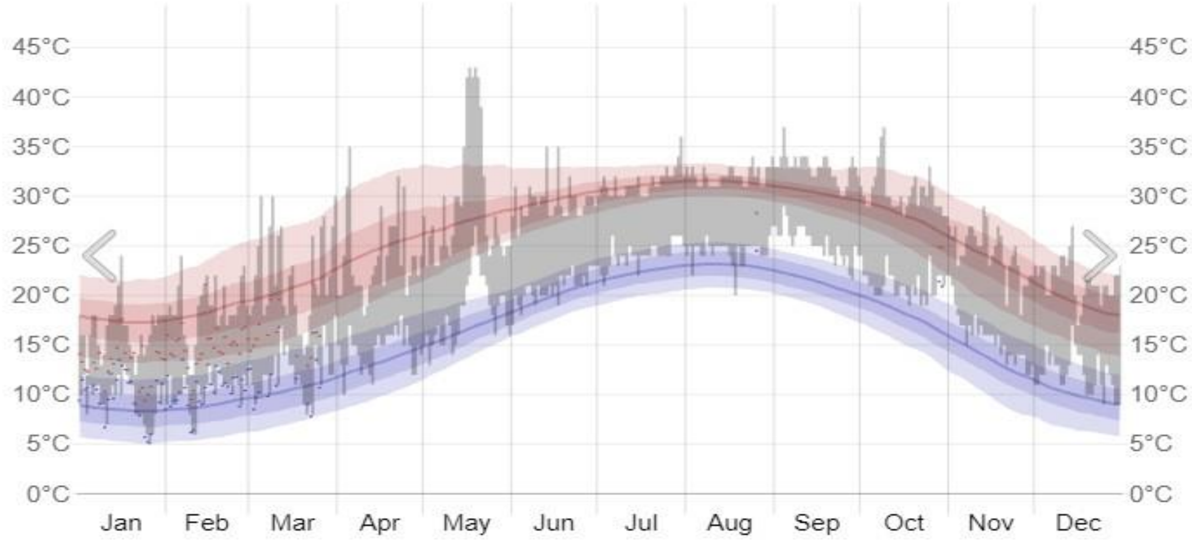

Figure 11 Temperature history in 2020 in Jericho

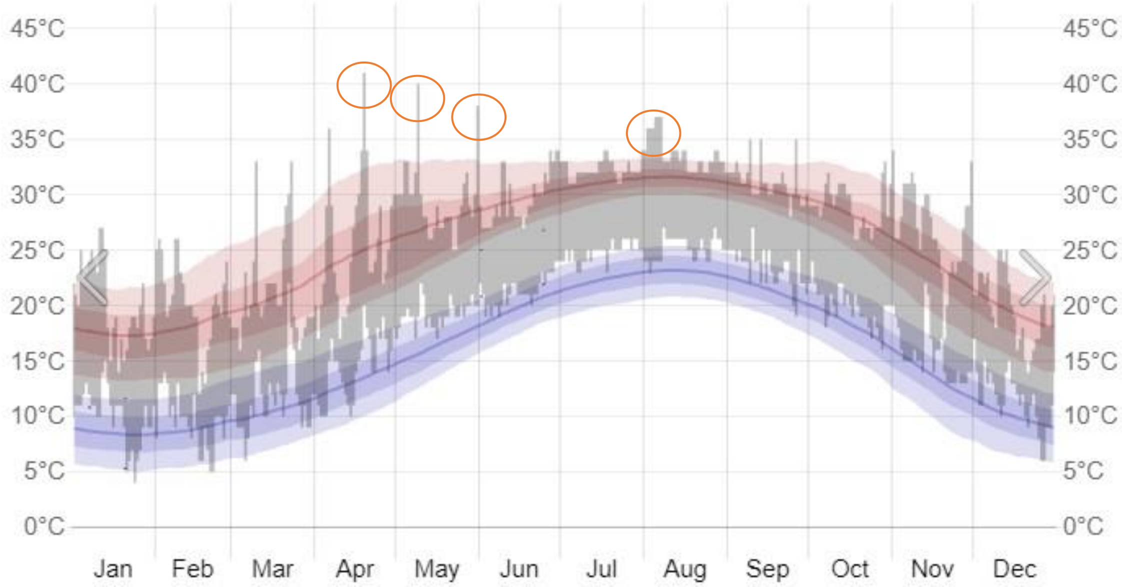

Figure 12 Temperature history in 2021 in Jericho

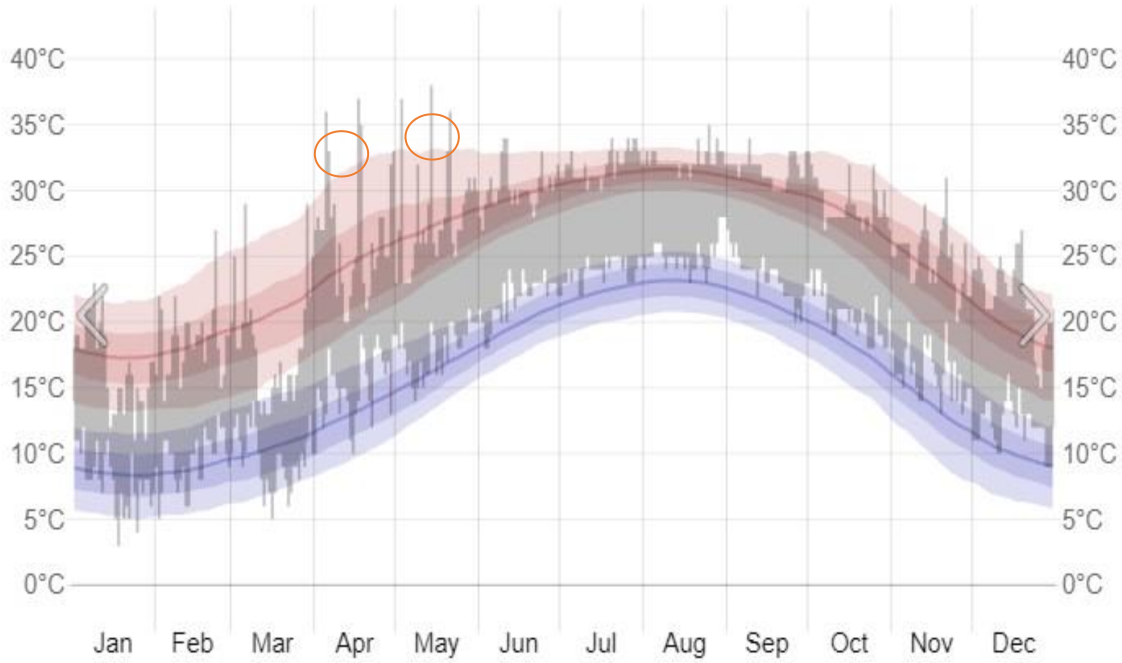

Figure 13 Temperature history in 2022 in Jericho

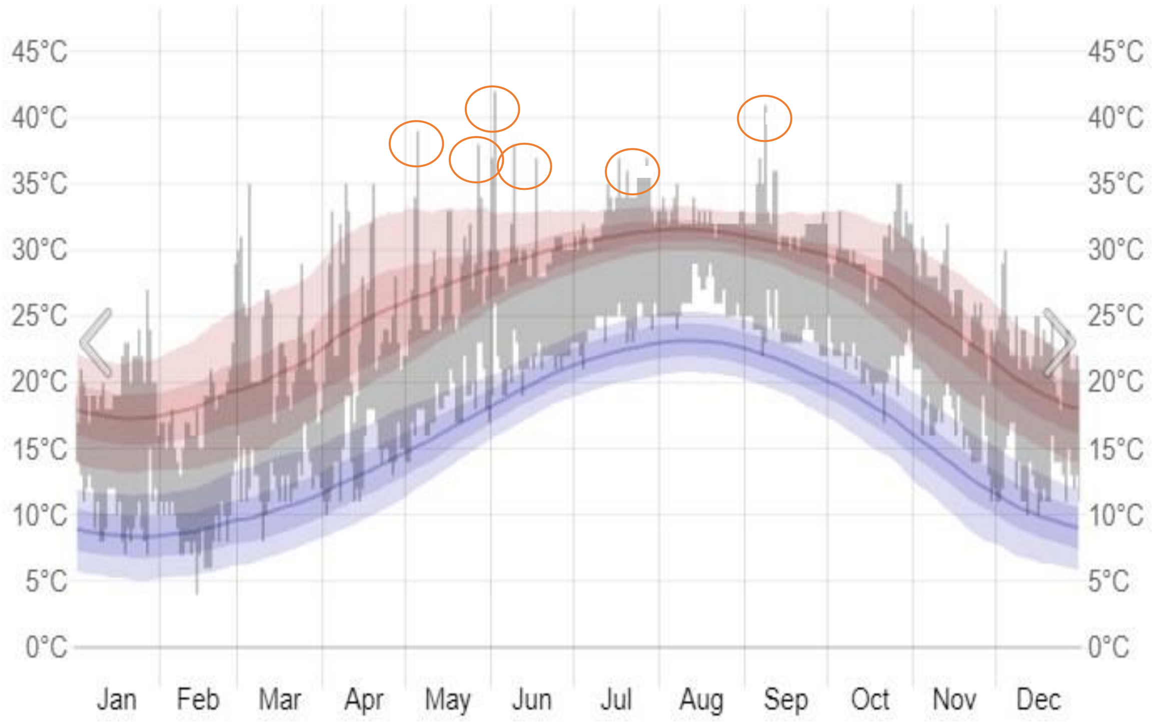

Figure 14 Temperature history in 2023 in Jericho

Figures from (9) to (14) (Weather Spark, n.d.) can be noted that temperatures in Jericho exceeded 35 degrees Celsius in all years, and exceeded 40 degrees Celsius in 2018, 2020, and 2022. High temperatures lead to increased demand for electrical energy, especially for refrigeration and air conditioning equipment. In Jericho, where temperatures exceed 40 degrees Celsius at times, this leads to a significant increase in demand for electrical energy and exposes the supply and distribution lines to the risk of breakdowns.

Applying the concepts, components and types of strategic planning on the impact of climate change on the strategic planning of the electric power sector in the West Bank by following the following steps:

Vision and Mission Statements

Vision: To be a leader in the region in adapting to climate change and building a resilient and sustainable electric power sector.

Mission: To provide reliable and affordable electricity to all residents of the West Bank while minimizing environmental impact and promoting climate change adaptation.

3. Goals and Objectives

Goal 1: Increase the share of renewable energy in the electricity mix to 45% by 2030.

Objective 1.1: Develop and implement policies to incentivize renewable energy development.

Objective 1.2: Invest in renewable energy infrastructure, such as solar and wind farms.

Objective 1.3: Promote energy efficiency and conservation measures.

Goal 2: Enhance the resilience of the electric power grid to climate change impacts.

Objective 2.1: Conduct vulnerability assessments to identify potential climate change impacts on the grid.

Objective 2.2: Develop and implement adaptation strategies to mitigate these impacts.

Objective 2.3: Improve disaster preparedness and response capabilities.

Objective 3: Strengthen national and regional cooperation on climate change adaptation in the electric power sector

Objective 3.1: Cooperation between distribution companies and neighboring countries to exchange best practices and resources

Objective 3.2: Participate in national and regional initiatives and projects related to climate change adaptation

Objective 3.3: Call for international support for climate change mitigation and adaptation in the region.

4. Strategies and Action Plans

Strategy 1: Implement a comprehensive renewable energy development plan.

Action Plan 1.1: Conduct feasibility studies for potential renewable energy projects
action Plan 1.2: Secure financing for renewable energy projects.

Action Plan 1.3: Develop regulatory frameworks to support renewable energy development.

Strategy 2 Strengthen the resilience of the electric power grid.

Action Plan 2.1: Upgrade and modernize grid infrastructure.

Action Plan 2.2: Implement distributed generation and microgrid solutions.

Action Plan 2.3: Develop emergency response plans for extreme weather events.

Strategy 3: Foster regional cooperation on climate change adaptation.

Action Plan 3.1: Establish a regional forum for sharing knowledge and expertise.

Action Plan 3.2: Develop joint projects to address common challenges.

Action Plan 3.3: Advocate for regional policy coordination on climate change.

5. Resource Allocation and Evaluation

Allocate sufficient financial and human resources to implement the strategic plan.

Establish a monitoring and evaluation framework to track progress towards achieving goals and objectives.

Regularly review and update the strategic plan as needed based on changing circumstances and new information.

2-15 The impact of climate change on the strategic plans of the energy sector

The impact of climate change on the strategic plans of the energy sector in the central West Bank appears within the following axes:

- The impact of climate change on the demand for electrical energy.

The impact of climate changes on the demand for electrical energy

1. Increased demand for energy during periods of extreme heat:

High temperatures lead to increased use of air conditioners, which leads to increased demand for electrical energy.

This can put significant pressure on electricity grids, increasing the risk of power outages.

2. Increased demand for energy during periods of extreme cold:

Low temperatures lead to the use of heating appliances, which leads to increased demand for electrical energy.

3. Effects of climate change on renewable energy sources:

Climate changes can affect the availability of renewable energy sources, such as solar energy.

4. The effects of climate change on electric energy policies:

Developing new policies to deal with the effects of climate change on the electric power sector.

These policies may include increasing investment in renewable energy sources, improving energy efficiency, and developing electricity grids.

5. Effects of climate change on the economy:

Climate changes can affect the electric power sector, which may affect the economy.

6. Effects of climate change on the environment:

Climate changes can affect the electric power sector, which may affect the environment, increased use of fossil fuels to generate electrical power can lead to increased greenhouse gas emissions.

7. The effects of climate change on national security:

Climate changes can affect the electric power sector, which may affect national security, power outages can disable critical infrastructure, potentially impacting national security.

8. The effects of climate change on sustainable development:

Climate changes can affect the electric power sector, which may affect sustainable development.

For example, increased use of fossil fuels to generate electricity could lead to increased greenhouse gas emissions, which could affect sustainable development.

- The impact of climate change on electrical energy sources.

1. Traditional sources:

Climate changes could lead to increased periods of power outages in vital places and emergency and communication centers in the country

2. Solar energy:

Climate changes can cause the sun to shine brighter, leading to increased solar energy production.

Clouds or increasing temperatures can lead to a decrease in solar energy production.

3. Wind energy:

Climate change can increase wind speeds, leading to increased wind energy production.

Quiet periods can also lead to reduced wind energy production.

- The impact of climate change on electricity transmission and distribution networks.

Climate change is a significant threat to electricity transmission and distribution networks. Utilities need to take steps to mitigate the impacts of climate change and ensure that they can continue to provide reliable electricity service.

2-16 The impact of climate change on the strategic plans of the energy sector in the center of the West Bank

The energy sector in the center of the West Bank faces several challenges due to climate change. These challenges include:

- Increased demand for energy: As temperatures rise, people will use more energy to cool their homes and businesses. This will put a strain on the existing energy infrastructure and lead to higher energy costs.
- Increased risk of extreme weather events: Climate change is expected to lead to more frequent and severe extreme weather events, such as heat waves, droughts, and floods. These events can damage energy infrastructure and disrupt energy supplies.

2-17 Climate change adaptation strategies:

There are a wide range of adaptation strategies that the energy sector can use to adapt to climate change.

These strategies include investing in renewable energy sources, improving energy efficiency, and adapting energy infrastructure to climate change.

2-18 Previous Literature

Climate change throws a long shadow over the Central West Bank in Palestine, posing significant threats to its energy sector. Understanding existing research is crucial for crafting effective strategies to navigate these challenges.

The following is a review of some previous studies:

A study done by Jaffe. A et al (2019) entitled “The Impact of Climate Risks on the Energy System Study of Financial, Security and Technological Dimensions” explores the financial, security and technological dimensions of climate change and its impacts on the energy system. It discusses the risks and impacts of climate change on the oil and gas industry, its impact on critical energy infrastructure, climate risks in financial markets, and its implications for US national security. The article emphasizes the need to understand and address the challenges posed by climate change to ensure the resilience and sustainability of the energy system. The objectives of the research in the article are the following:

1. Assess the financial impacts of climate risks on the energy sector, including potential impacts on investment, operational costs and revenue streams.

2. To analyze the security dimensions of climate change on the energy system, including risks to critical infrastructure and supply chain disruptions

3. Assess the technological challenges posed by climate risks, such as the need for adaptation and resilience measures in energy production and distribution.

4. Study the potential impacts of climate change on specific energy sources, such as oil, gas, renewable energy, and nuclear energy.

5. Identify strategies to mitigate climate risks and enhance energy system resilience.

The methodology used by the authors in their studies on the impact of climate change on the energy sector includes relying on available statistical data and technical information, as well as analyzing temporal trends of energy consumption and production. In addition, interviews with industry experts and government officials.

Reviewing several previous severe climate changes in many American states and analyzing them by identifying the most important weaknesses of the system and its inability to withstand multiple climate changes.

The methodology used by the authors in their studies on the impact of climate change on the energy sector includes comprehensiveness and reliance on available statistical data and technical information, as well as financial analysis and its relationship to companies and stocks, in addition to interviews with industry experts and government officials.

The methodology used by the authors in their studies on the impact of climate change on the energy sector includes comprehensiveness and reliance on available statistical data and technical information, as well as financial analysis and its relationship to companies and stocks, in addition to interviews with the industry. Experts and government officials.

A specific sample of the data was not studied, but it is noteworthy that the study reviewed several previous severe climate changes in many American states and analyzed them by identifying the most important weak points in the system and its inability to withstand multiple climate changes such as hurricanes, fires, and floods.

The most important risk indicated by the study is that climate change threatens the energy infrastructure in the United States, which is a major threat to the American economy and national security. Policymakers need to pay greater attention to policy options to identify, anticipate, and mitigate these risks. Other critical infrastructure, such as water refining, water transportation, and water supply in the United States, depends on electricity services, and power outages can cause fuel production and distribution sites and even retail gasoline stations to stop operating.

It can be noted that the most important recommendation is that the energy system in the United States is going through a major transformation phase driven by technological progress. Therefore, it is recommended to update a risk map by emergency management and design a flexible system capable of facing the worsening climate changes expected later this century based on the decentralization of energy supply and distribution, the use of renewable energy and its storage, and the conversion of some networks to lines buried underground.

The research is distinguished in several aspects, the most important of which is the analytical study of each extreme weather situation and its contribution to the comprehensive strategic formulation of climate challenges and their impact on the energy sector, and the analytical link between the impact of climate change on the energy sector and other sectors such as the financial sector and national security. An additional advantage of studying.

- 2-16-B Study for Rajbhandari. Y et al (2021) entitled “Impact Study of Temperature on the Time Series Electricity Demand of Urban Nepal for Short-Term Load Forecasting” aims to evaluate the effect of temperature on urban electricity demand in Nepal. The findings of this study are important for the Nepalese power sector, as they can be used to improve the accuracy of short-term load forecasting models.

The study used monthly data on electricity demand and temperature from five urban areas in Nepal from 2010 to 2019. A linear regression model was used to estimate the relationship between temperature and electricity demand.

The study used monthly data on electricity demand and temperature from the following five urban areas in Nepal:

Kathmandu, Pokhara, Biratnagar, Lalitpur and Siliguri.

The electricity demand data was collected from the Nepal Electricity Authority (NEA). The temperature data was collected from the National Meteorological Department of Nepal.

The study used a linear regression model to estimate the relationship between temperature and electricity demand. A linear regression model is a statistical model that describes the relationship between two or more variables in a straight line. In this case, the two variables were temperature and electricity demand.

The regression model was estimated using the following equation:

electricity demand = $\alpha + \beta$ temperature

where:

α is the intercept

β is the slope

The intercept is the value of electricity demand when the temperature is 0 degrees Celsius. The slope is the rate of change in electricity demand concerning temperature.

The results of the regression analysis showed that the intercept was 1,200 megawatts and the slope was 0.02. This means that for every Celsius increase in temperature, electricity demand increases by 0.02 megawatts.

This finding is consistent with the findings of previous studies on the impact of temperature on electricity demand. This is likely because people use more electricity for cooling when temperatures are high.

The study recommends that temperature be included as a factor in short-term load forecasting models for urban Nepal. This could help to improve the accuracy of these models, which could help to ensure that there is sufficient electricity supply to meet demand.

The study found that temperature has a significant impact on electricity demand in urban Nepal. This finding is important for the Nepalese power sector, as it can be used to improve the accuracy of short-term load forecasting models.

The similarity between the study and the case study in the central West Bank is one of the most important reasons for choosing the study by the researcher. The importance of the study can be seen in terms of the statistical analysis method and the distinction between workdays and weekends.

- 2-16-C Study for Daniel Burillo (2018) entitled “Effects of Climate Change in Electric Power Infrastructures”

The study aims to analyze how various climate change factors, including temperature variations, water availability, extreme weather events, and changing precipitation patterns, impact the energy sector's infrastructure, operations, and long-term planning strategies. By evaluating these factors, the study seeks to identify vulnerabilities, risks, and opportunities for adaptation and resilience within the energy sector in the face of a changing climate.

The importance of the study is:

1. Understanding the impacts of climate change on the energy sector: The study helps analyze and understand how climate change factors affect the energy sector and identify weak points and opportunities to improve sustainability and resilience.

2. Identifying vulnerability and threats: By assessing the impacts of climate change, areas that may be vulnerable to vulnerabilities and threats can be identified, which helps in taking actions to reduce risks and enhance preparedness.

3. Improving planning strategies: By understanding how climate change affects long-term planning strategies, these strategies can be improved to be more flexible and effective in facing future challenges.

4. Enhancing the ability to adapt: Understanding the effects of climate change contributes to building the sector’s capabilities to adapt to changing environmental challenges and ensuring the sustainability of its operations.

5. Decision-making support: The study provides the information necessary to make informed strategic decisions to strengthen the energy sector and ensure its continuity in light of the increasing climate challenges.

The objectives of the study are:

1. Analyze the effects of climate change on the energy sector.

2. Assess the vulnerability and threats of those influences.

3. Identify opportunities to enhance sustainability and resilience in the energy sector.

4. Improving planning strategies to confront climate challenges.

5. Supporting strategic decision-making to enhance readiness and sustainability in the energy sector.

The article uses statistical methods such as regression techniques to fit structural equation models to predict peak electricity demand for future temperatures. It also utilizes historical climate data to estimate overloading risks in the base period and compute thermally de-rated load factors on infrastructure hardware.

The study forecasts future peak electricity demand considering rising temperatures, population growth, and building stock turnover. It identifies specific cities and neighborhoods at risk of overloading and outages during heat waves in 2060. Mitigation and adaptation options for maintaining stability in electric power systems are categorized as technology implementations, market incentives, and building stock, with consideration for load variance and effects on other interdependent factors.

The importance of the study for the researcher is that the study Focuses on improving planning strategies to confront climate challenges. This suggests that the study aims to develop and refine methods for planning and preparing for the impacts of climate change. Supports strategic decision-making to enhance readiness and sustainability in the energy sector. This indicates that the study seeks to provide insights and recommendations that can inform decision-making within the energy sector, leading to increased preparedness and resilience in the face of climate change.

- 2-16-D A study for Emenekwe C. & Emodi N. (2022) titled "Temperature and Residential Electricity Demand for Heating and Cooling in G7 Economies: A Method of Moments Panel Quantile Regression Approach"

This study found that temperatures have a positive impact on residential energy consumption for heating and cooling in G7 economies. These findings can help governments in G7 economies understand and manage residential energy demand.

Residential energy consumption is one of the most important sources of energy demand in the world. Therefore, it is important to understand the relationship between temperatures and residential energy consumption, especially in the context of climate change, which is leading to rising global temperatures.

This study aims to evaluate the relationship between temperatures and residential energy consumption for heating and cooling in G7 economies.

The study used data on residential energy consumption and temperatures from 1990 to 2020. A multivariate logistic regression model was used to estimate the relationship between the two variables.

The study sample included G7 economies, namely Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.

The study found that temperatures have a positive impact on residential energy consumption for heating and cooling in G7 economies. As temperatures increase, residential energy consumption increases.

More specifically, the study found that temperatures have a larger positive impact on residential energy consumption for cooling than for heating. This is likely due to the fact that the demand for energy for cooling increases more rapidly than the demand for energy for heating as temperatures rise.

Based on the findings, the study recommends the following:

• Governments in G7 economies should consider the relationship between temperatures and residential energy consumption when planning electricity grids and climate policy.

• Governments in G7 economies should encourage residential energy efficiency to reduce reliance on conventional energy.

The researcher believes that the study differs from previous studies in the study locations, as it included 7 countries with advanced economies and focuses on residential demand for electricity for heating and cooling, as this is consistent with the researcher's case study in that heating and cooling are the largest influences on consumption during severe climate changes.

Through the researcher's review of previous studies on the impact of climate change on electricity demand, it becomes clear that previous studies are important in providing insight into the size and nature of this impact. These studies have generally found that rising temperatures lead to increased demand for electricity, especially in the summer and in hotter regions. Most previous studies on the impact of climate change on electricity demand have aimed to estimate this impact. Some studies have also sought to identify the factors that affect this relationship, and others have provided recommendations for policymakers to address this impact.

Most previous studies have used a quantitative approach, such as time series analysis or structural equation modeling. Some studies have used a qualitative approach; such as interviews or surveys.

Chapter 3

Jerusalem Electricity Company as Case Study

Introduction

This study aims to analyze the relationship between temperature change and peak electricity demand within the Jerusalem District Electricity Company (JDECo) concession area, which covers the cities of East Jerusalem, Ramallah, Bethlehem, and Jericho. The West Bank is suffering from the effects of climate change, including high Temperatures and increased frequency of extreme weather events. These changes have a significant impact on the energy sector, especially on peak electricity demand.

3-1 Jerusalem Electricity Company

Established in 1914, JDECo boasts a long and rich history, making it one of the oldest electricity companies in Palestine.

Supplying electricity to over 343,000 customers, equivalent to roughly one million people, across four major areas (Jerusalem, Ramallah, Bethlehem, and Jericho), JDECo plays a crucial role in powering the Central West Bank. This extensive coverage translates to a significant influence on the region's economic activity and quality of life.

With annual sales exceeding $400 million and a maximum load exceeding 692 MW, JDECo demonstrates financial standing and operational efficiency. These figures highlight its importance as a key player in the Palestinian economy[1]. (Jerusalem Governorate Electricity Company, 2022).

[1] Jerusalem Governorate Electricity Company. (2022). Annual report 2022 [Arabic]. Retrieved from https://www.jdeco.net/ar_folder.aspx?id=FWg0CFa23793825aFWg0CF (Note: Website available only in Arabic)

JDECo's reliance on a diverse set of power sources, including the Israeli Electricity Company, the Palestinian Transport Company, the Hashemite Kingdom of Jordan, and even solar power stations, signifies its adaptability and commitment to ensuring energy security for its customers. This diversification also reduces dependence on any single source, mitigating potential risks.

Future Growth Potential: Considering JDECo's load forecast to reach 1,182 MW by 2032, the company is poised for significant growth in the coming years. This necessitates strategic investments in infrastructure and renewable energy sources to meet the increasing demand sustainably.

Overall, JDECo emerges as a vital force in the Palestinian energy sector, contributing to regional development, economic prosperity, and improved living standards. Its future, fueled by its historical legacy, diverse power sources, and a clear focus on growth, seems bright and the Percentages of consumption sectors in the Jerusalem Electricity Company as shown in table 3.

Percentages of consumption sectors in the Jerusalem Electricity Company[2].(Jerusalem Governorate Electricity Company, 2022).

Table 3 Percentages of consumption sectors in the Jerusalem Electricity

Sector	Percentages of consumption
Residential	55%
Commercial	23%

[2] Jerusalem Governorate Electricity Company. (2022). Annual report 2022 [Arabic]. Retrieved from https://www.jdeco.net/ar_folder.aspx?id=FWg0CFa23793825aFWg0CF

Industrial	3%
Agricultural	1%
Others	18%

3-2 Research Methodology

A general methodology to explore relationships involves the following steps:

1- Identify climate change variables: Temperature will be relied upon as one of the biggest influences on electrical energy consumption based on previous studies and the availability of relevant data.

2- Research methodology

• The historical approach for collecting data from the historical records related to: climate change variables, electrical energy consumption, and peak demand from meteorological agencies and the records of the Jerusalem Electricity Company.

• Analytical approach: Analyzing data to identify patterns and connections between climate change variables, electrical energy consumption, and peak demand. Statistical methods, such as regression analysis, time series analysis, and correlation analysis, can be used to determine the relationships between these variables.

3-3 Historical-analytical method

Introduction: The historical-analytical approach is a research method on the impact of climate change on the energy sector strategic plan. It combines the strengths of historical research with analytical methods to provide a comprehensive understanding of the issue.

Historical research: Examines past events and trends to understand how they shaped the current situation.

Analytical methods: It involves using different techniques to analyze data and draw conclusions.

Use statistical analysis, GIS mapping, or qualitative analysis to examine the relationship between climate change, energy consumption, and strategic planning.

This will help to identify patterns and trends, and assess the impact of climate change on the energy sector.

Benefits of the historical-analytical approach:

Provides a deeper understanding of the issue by examining its historical context and current implications.

It allows to identify the causes of problems and develop effective solutions.

3-4 Stages of the case study

3-4-1 The first stage:

After reviewing previous studies and the researcher's previous experience, the following determinants were identified:

1- The boundaries of the spatial study for the four governorate areas in the central West Bank: Jerusalem, Ramallah, Bethlehem, and Jericho.

2- Excluding social factors (population increase) and economic factors (economic growth and investment projects) by studying the change in temperature for each season of the year individually.

3- A distinction will be made between working days and weekly or annual vacation days in the study due to the difference in citizens' behavior and its impact on energy consumption, as in some previous studies.

3 The effect of temperatures on maximum consumption will not be studied during the spring and fall seasons, as the effect is limited and there are no real challenges to energy security.

4 Temperature change was considered as an independent variable and electrical energy consumption as a dependent variable.

5 Determine the periods of maximum loads during the summer and winter seasons from 2018 to 2023

3-4-2 The second stage:

Take a sample of the maximum consumption of some study areas within the period chosen for the study and compare it with the temperatures in Bethlehem, as shows in table follows.

Table 4 Comparison between the maximum load consumption and temperature for Bethlehem Governorate -2021

Date	Time	Temp.	Peak Load (MVA)
17.1.2021	17:40	8	90.19
18.1.2021	17:40	5.7	93.88
19.1.2021	17:40	6.8	94.20
20.1.2021	17:40	3.1	100.5
21.1.2021	17:40	5.4	95.32

2- During the preliminary examination, it was found that the correlation coefficient between temperature and energy consumption for the city of Bethlehem for the year 2021: -0.9413

As shown in fig. (15) that there is a close relationship between temperature changes and their impact on energy consumption during peak loads.

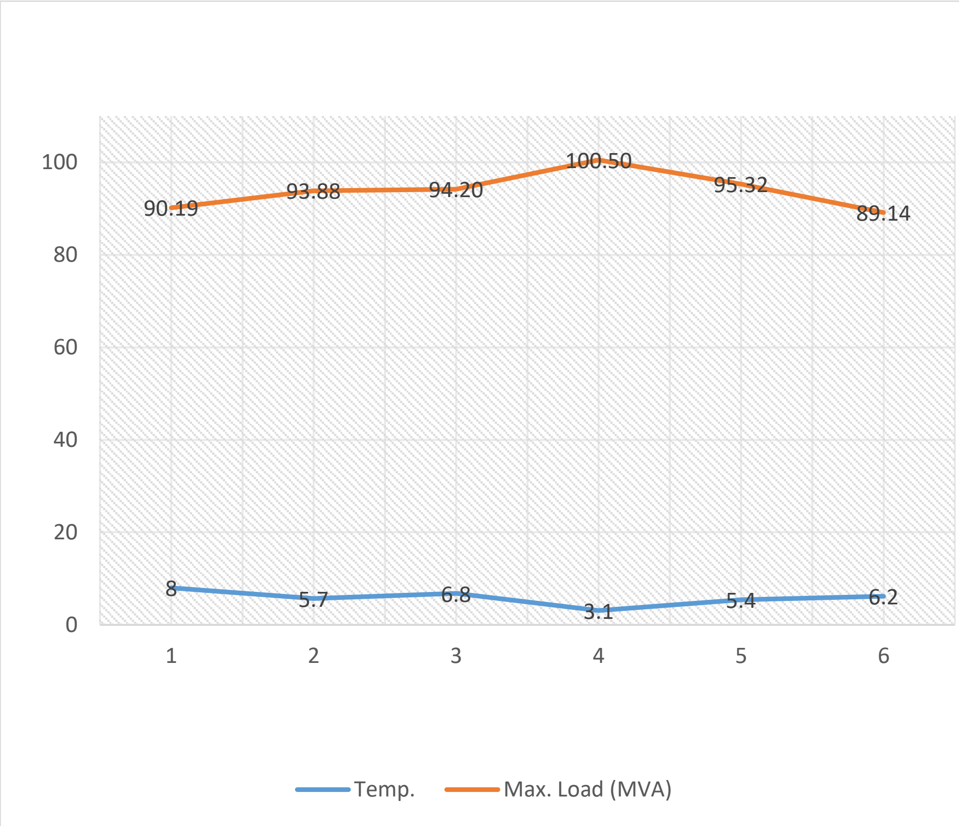

Figure 15 show that there is a close relationship between temperature changes and their impact on energy consumption during peak loads.

Verify the percentage of increase in the maximum load when the temperature drops by one degree, which is: 2.24%

3-4-3 Third Stage:

Collect all necessary data, which are as follows:

1-Extracting data on maximum energy load consumptions during the summer and winter seasons from 2018 to 2023 from the control and monitoring system of the Jerusalem Governorate Electricity Company

2-Data were extracted every ten minutes and included 6 days before the maximum load period for energy consumption and 6 days after the maximum load period for energy consumption and throughout both the summer and winter seasons during the study period.

3-Temperature values during the same study period were extracted from https://ims.gov.il/ar/data_gov

4-Energy consumption data and temperature values were arranged in special tables for statistical analysis.

3-4-4 Fourth Stage:

At the beginning and before reviewing the results of this study, it is necessary to list the method that was followed in the analysis in order to extract the results of this study with all its required paragraphs: At the beginning and after the method of collecting data for this study, the necessary methods for analysis were carried out, and these are the methods that must be followed to extract The results of this study and the forefront of these methods were:

1 - Coding and numbering these data, which number (19,799) individually.

2 - All of this data was entered in order according to each season, year, and temperature for each of the studied cities into the statistical analysis program Statistical Package for the Social Sciences (spss).

3 - Carrying out the rest of the necessary analysis operations, which are:

A - Extract the value of the correlation coefficient and determine the nature of the relationship between temperature and the value of electrical energy consumption.

B - Writing the statistical equation extracted after determining the value of the correlation coefficient, and this equation represents the extent of the existence and nature of the relationship linking the two variables studied, which are: “Temperature measurement = and the amount of total and partial electrical energy consumption separately.” Which, in most measurements in the current study, indicated that temperature has a clear effect on the use of electrical energy in summer and winter, and this equation represents the model for the regression line (straight line equation) and the nature of its direction according to the existing values and the relationship in most of them between the two variables (influencing and affected). Therefore, it is called the linear equation, that is, it explains the nature of the straight line trend of the direction of the larger values from the influencing variable, which is here represented by (temperature), towards the affected variable (output), which is here represented by the value of the total consumption of electrical energy in the studied areas of the Palestinian Arab community.

As for extracting consumption values, this was done using appropriate statistical analysis methods, represented by dividing the entire total and partial consumption value separately by the number of temperatures present.

As for the percentage taken from the consumption value for each temperature from each region, it was represented by extracting this percentage from the consumption extracted from the consumption value for each temperature consumed from each region separately (mentioned in the previous step).

As for determining the differences between the highest consumption value and the lowest consumption value, this was represented by subtracting the smallest value from the largest consumption value. Likewise, for extracting the differences between the highest and lowest temperature, this was represented by subtracting the minimum temperature value from the largest temperature value and taking the differences between them, and thus this was used. Methods for examining all macro and micro areas of the studied cities in Palestinian society, which are: (Jerusalem City, Ramallah City, Bethlehem City, and Jericho City).

- Study results: Summer 2018: -

There is a statistically significant relationship between temperature and the total consumption rate, and it may be proportional to the regression equation as follows:

Y = a + b

Y = 15.238 + 11.231

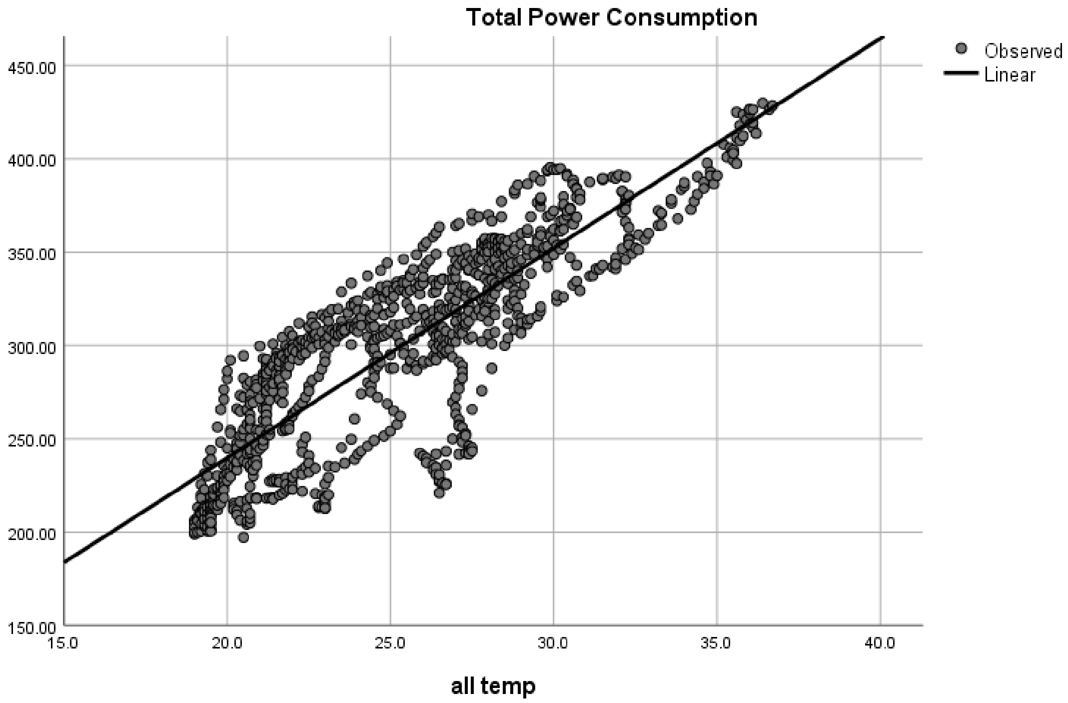

Figure 16 relationship between temperature and the total consumption rate

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature increase reached a value of (11.71MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.72%), and that the difference in consumption between the highest value and the lowest value reached (232.57MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (17.7 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = -1.990 + 3.986

It also appeared through the analysis of the data of this study that the amount of impact of every single temperature increase reached (3.91MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (2.72%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value reached (77.8 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (17.7 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 7.939 + 4.271

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached a value of (4.62 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.77%) in the city of Ramallah, the difference in total consumption between the highest value and the lowest value reached (94.86 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (17.4 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

$Y = a + b$

$Y = 8.203 + 2.046$

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached (2.40 MVA) of the total consumption, and the percentage change in the value of the total consumption amounted to (2.87%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value has reached

(48.63 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (17.9 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

$Y = a + b$

$Y = 8.229 + .699$

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature rise reached a value of (0.86 MVA) on the total consumption, and the percentage change in the value of the total consumption amounted to a value of (2.26%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value has reached

(23.58MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (18 degrees Celsius).

- Study results: Summer 2019: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 507.895 + -8.143

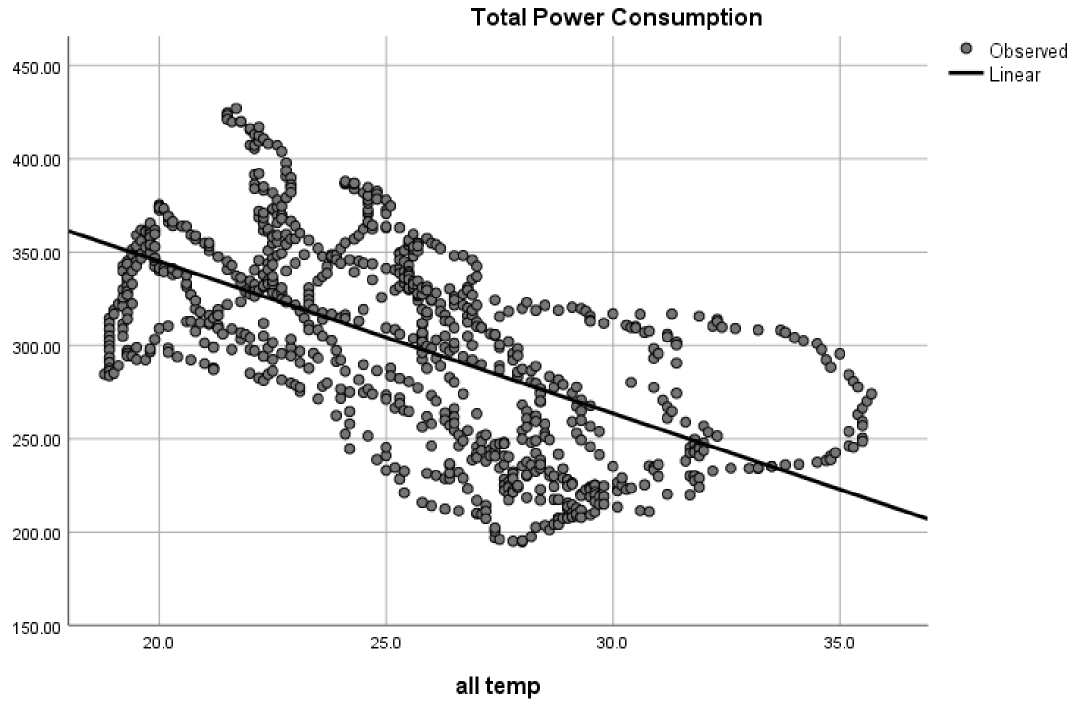

Figure 17 show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature increase reached a value of (11.96 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.80%) and that the difference in the total consumption Between the highest value and the lowest value it reached (232.15 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (16.9 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

Y = a + b

Y = 176.787 + -2.859

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature rise reached a value of (4.40 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.80%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value has reached

(89.07 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(16.9 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 199.968 + -3.369

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature rise reached a value of (4.79 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.79%) in the city of Ramallah, the difference in total consumption between the highest value and the lowest value has reached

(97.13 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (17.2 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 95.100 + -1.617

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached (2.38 MVA) of the total consumption, and the percentage change in the value of the total consumption amounted to (2.89%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value reached (45.89 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (17.5 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 41.797 + -.532

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature rise reached a value of (0.85 MVA) on total consumption, and the percentage change in the value of total consumption amounted to (2.23%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value has reached

30.54 MVA It also appeared that the differences between the lowest and highest temperature reached a value of (18.8 degrees Celsius).

- Study results: Summer 2020: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 389.821 + -2.020

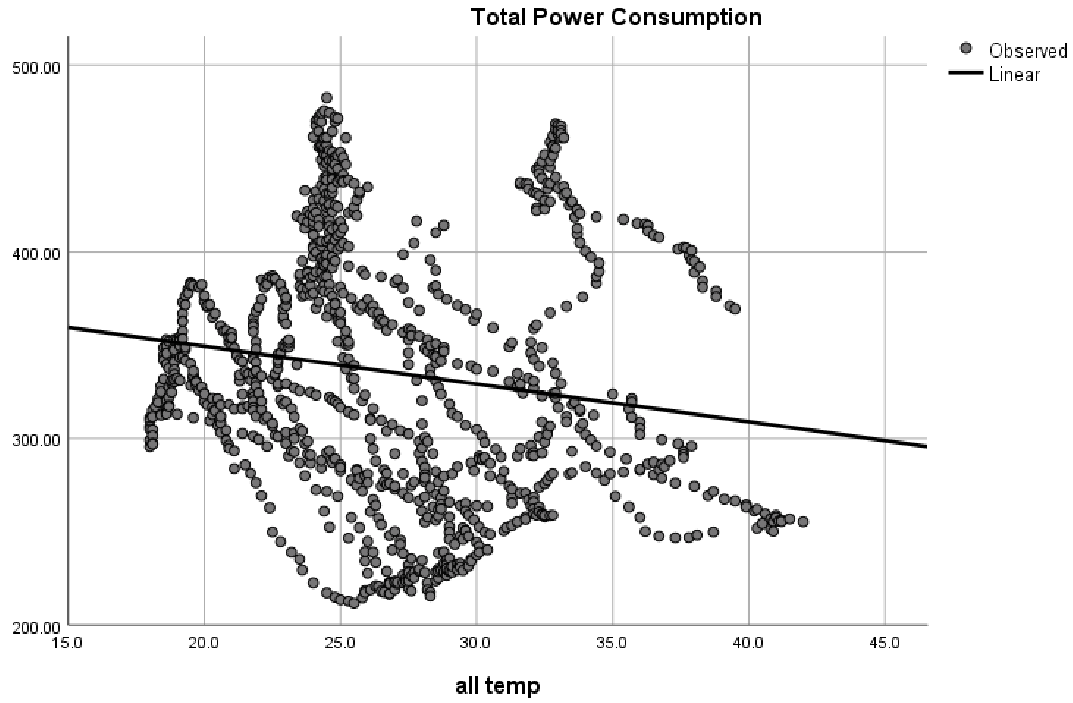

Figure 18show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature rise reached a value of (11.49 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.38%) and that the difference in the total consumption Between the highest value and the lowest value it reached (270.81 MVA). It also appeared that the differences between the lowest and highest temperatures reached (24 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

Y = a + b

Y = 126.739 + -.414

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached (4.13 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (2.38%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value has reached

(102.24 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(24 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 153.031 + -1.147

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature rise reached a value of (4.50 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.46%) in the city of Ramallah, the difference in total consumption between the highest value and the lowest value has reached

(106.43 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(23.2 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 76.419 + -.625

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature increase reached (2.36 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (2.63%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value reached (52.47 MVA). It also appeared that the differences between the lowest and highest temperatures reached (22.2 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 50.371 + -.453

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature rise reached a value of (0.97 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.28%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value has reached

(16.22 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (18.8 degrees Celsius).

Study results: Summer 2021: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = -2.040 + 13.026

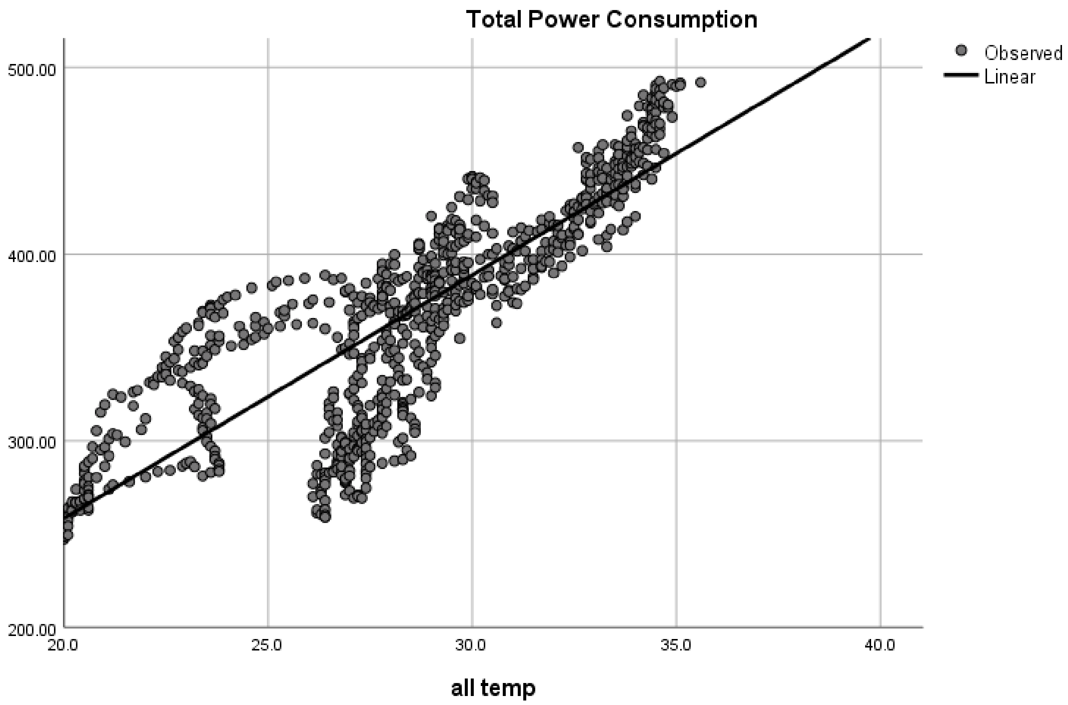

Figure 19 show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature increase reached a value of (13.83 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.80%) and that the difference in the total consumption Between the highest value and the lowest value it reached (245.16 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (15.6 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

Y = a + b

Y = -13.809 + 4.775

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached (4.71 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (2.80%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value has reached

(88.17 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (15.6 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 2.633 + 4.961

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached (5.33 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (2.81%)

in the city of Ramallah, the difference in total consumption between the highest value and the lowest value has reached

(96.68 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(15.2 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = -2.344 + 2.554

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached (2.75 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (2.94%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value has reached

(52.11 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(15.2 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 9.698 + .891

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached a value of (1.11 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.27%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value has reached (27.07 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (16.4 degrees Celsius).

- Study results: for the summer of 2022: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 36.812 + 13.083

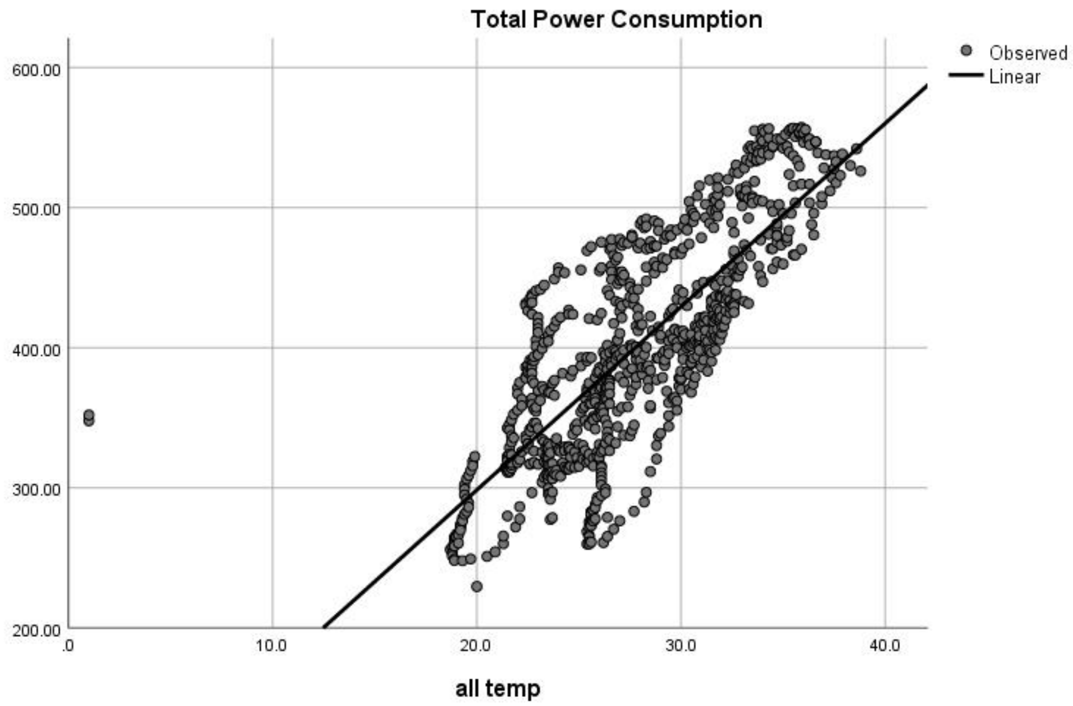

Figure 20 show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect for each single temperature rise reached a value of (14.36 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.57%) and that the difference in the total consumption Between the highest value and the lowest value it reached (327.66 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (37.8 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

Y = a + b

Y = -6.730 + 5.017

It also appeared through the analysis of the data of this study that the amount of impact of every single temperature increase reached (4.98 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (2.57%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value has reached (125.57 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (20.1 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 11.163 + 5.369

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached (6.08 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (2.83%) in the city of Ramallah, the difference in total consumption between the highest value and the lowest value has reached

(145.25 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(17.4 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 1.568 + 2.630

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached (3.05 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (2.96%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value reached (62.38 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (16.5 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 10.780 + 1.028

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature rise reached a value of (1.30 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.36%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value has reached (30.26 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (16.8 degrees Celsius).

- Study results: Summer 2023: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = -206.459 + 17.900

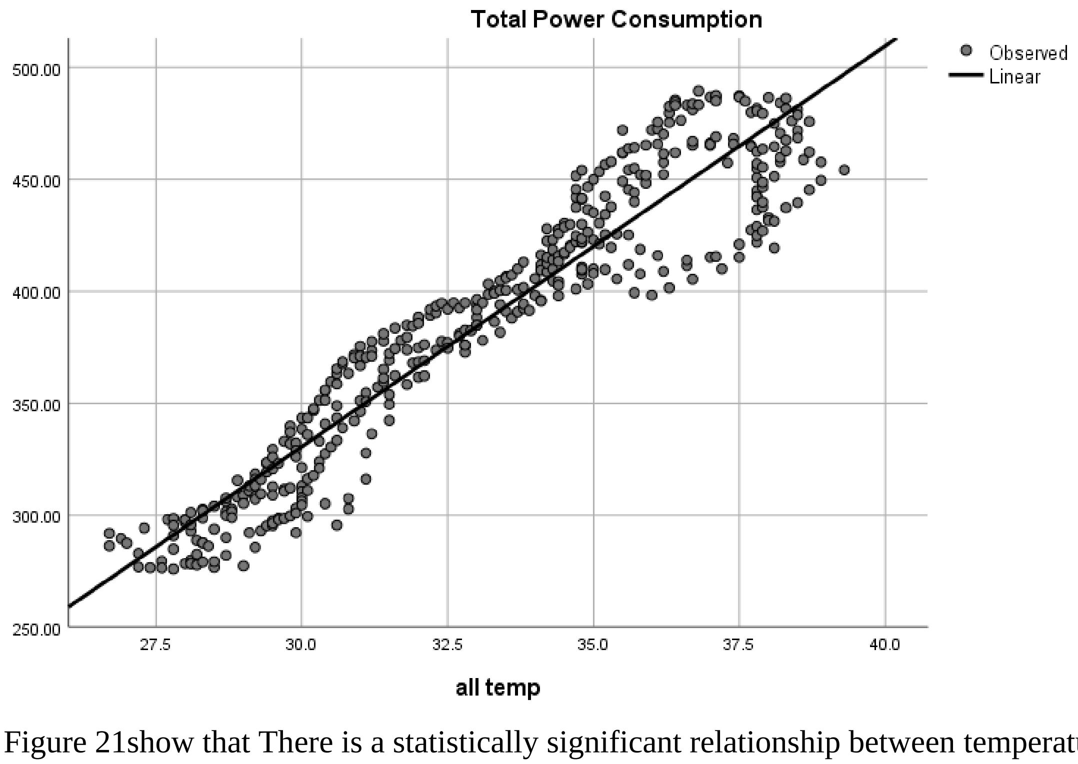

Figure 21show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature increase reached a value of (12.45 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.54%) and that the difference in the total consumption Between the highest value and the lowest value it reached (213.5 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (12.6 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

Y = a + b

Y = -93.613 + 6.501

It also appeared through the analysis of the data of this study that the amount of impact of every single temperature increase reached (4.09 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (2.54%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value has reached (75.62 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (12.6 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 11.631 + 5.742

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached (5.99 MVA) of the total consumption, and the percentage change in the value of the total consumption amounted to (3.17%) in the city of Ramallah, the difference in total consumption between the highest value and the lowest value has reached

(84.5 MVA). It also appeared that the differences between the lowest and highest temperatures reached (11.9 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 3.319 + 3.024

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached (3.24 MVA) of the total consumption, and the percentage change in the value of the total consumption amounted to (3.49%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value reached (43.62 MVA). It also appeared that the differences between the lowest and highest temperatures reached (11 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = -.093 + 1.394

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature rise reached a value of (1.45 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.54%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value has reached (32.39 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (12.6 degrees Celsius).

- Study results: winter 2018: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 281.586 + 7.406

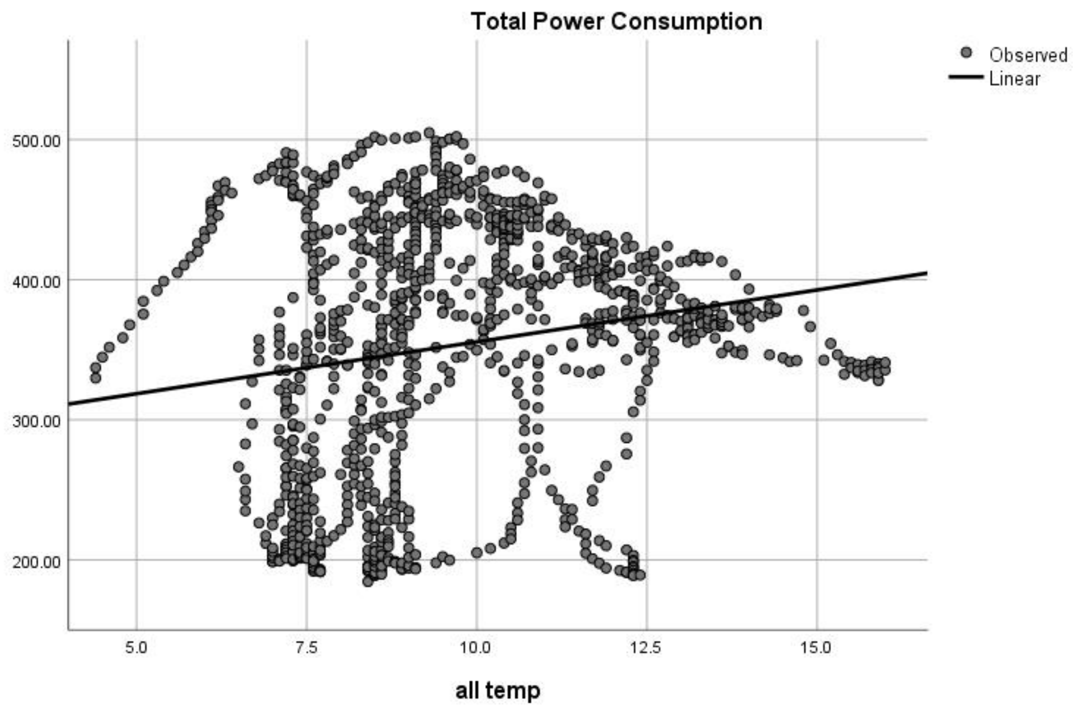

Figure 22 show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (31.55 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (6.25%) and that the difference in the total consumption Between the highest value and the lowest value it reached (320.3 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (11.6 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

Y = a + b

Y = 134.201 + 1.035

It also appeared through the analysis of the data of this study that the amount of impact of each drop in temperature reached a value of (13.57 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (6.25%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value reached (141.56 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (11.6 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 109.459 + 2.207

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (11.28) of the total consumption, and the percentage change in the value of the total consumption amounted to (6.09%) in the city of Ramallah, the difference in total consumption between the highest value and the lowest value reached (127.99 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (12 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 53.646 + 1.505

It also appeared through the analysis of the data of this study that the amount of impact of each drop in temperature reached (6.76) of the total consumption, and the percentage of change in the value of the total consumption amounted to (7.29%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value reached (59.42 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (11.4 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 8.781 + .336

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (0.83 MVA) on the total

consumption, and the percentage of change in the value of the total consumption amounted to a value of (4.36%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value has reached
(15.37 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (12.8 degrees Celsius).

- Study results: winter 2019: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 428.604 + -6.572

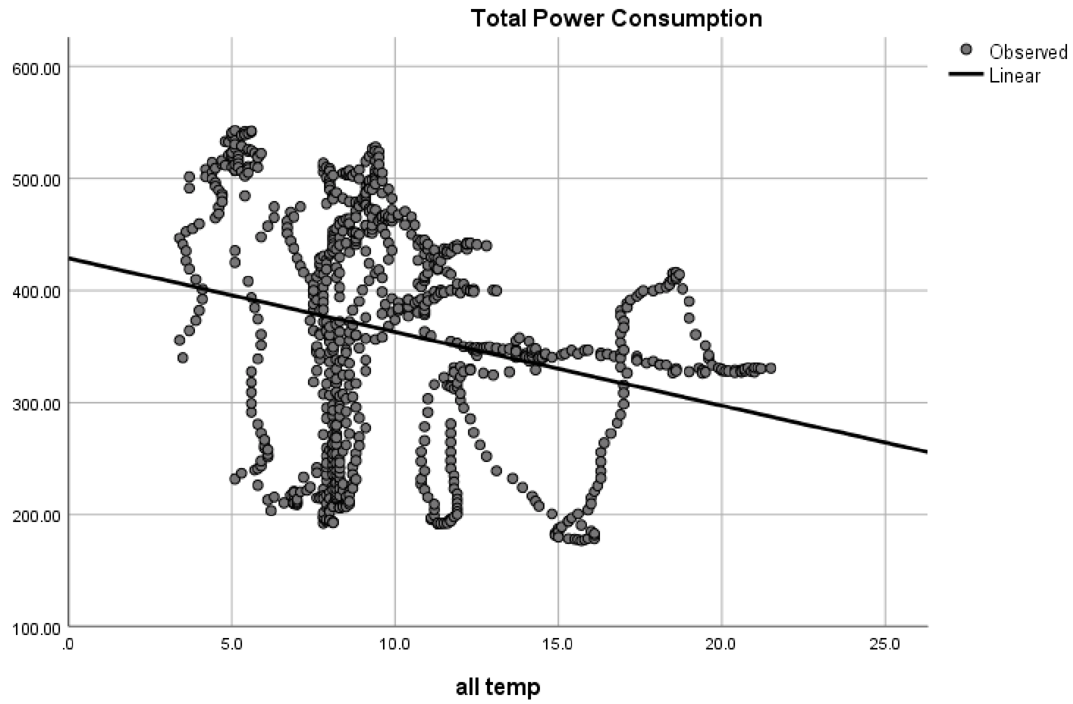

Figure 23 show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (25.24 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (4.65%) and that the difference in the total consumption Between the highest value and the lowest value it reached (366.18 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (18.1 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

Y = a + b

Y = 190.268 + -4.174

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (10.74 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (4.65%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value reached (162.06 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (18.1 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 156.113 + -2.226

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (9.93 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (4.85%) in the city of Ramallah, the difference in total consumption between the highest value and the lowest value has reached

(139.56 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (17.2 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 72.325 + -.532

It also appeared through the analysis of the data of this study that the amount of impact of each drop in temperature reached a value of (5.03 MVA) on the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (5.31%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value has reached

(62.08 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(1 6.8 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 12.896 + .079

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (0.71 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (3.53%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value has reached

(11.34 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (16.8 degrees Celsius).

- Study results: winter 2020: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 406.299 + -2.093

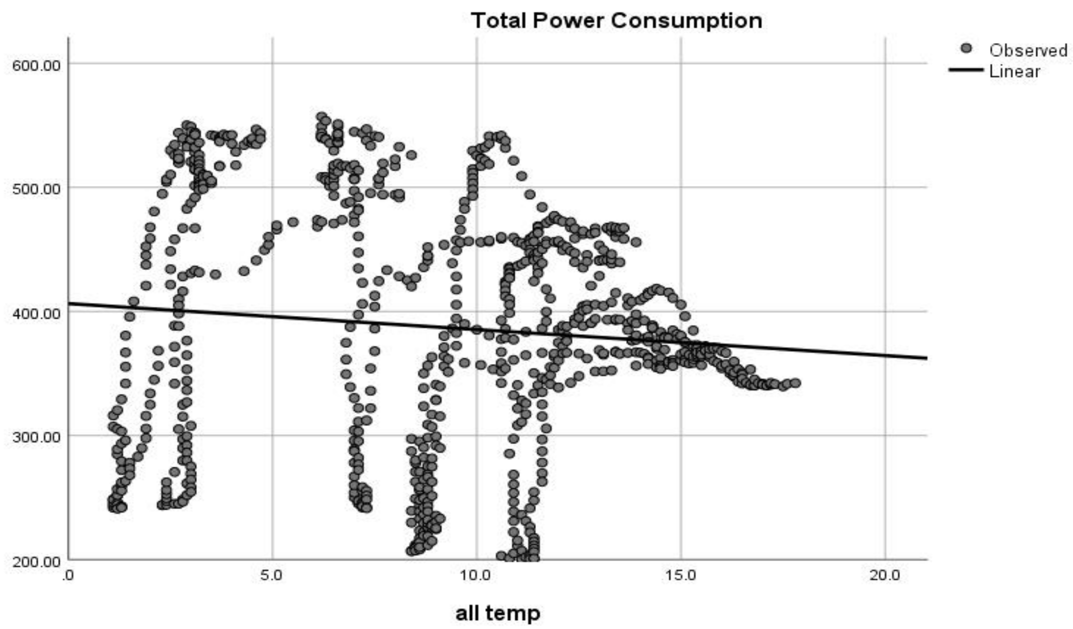

Figure 24 show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (31.28 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (5.61%) and that the difference in the total consumption Between the highest value and the lowest value it reached (356.76 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (16.7 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

Y = a + b

Y = 179.080 + -2.013

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (13.59 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (5.61%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value reached (158.8 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (16.7 degrees Celsius).

In the city of Ramallah, it appeared that there was no statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 146.656 + -.384

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (12 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of

(5.71%) in the city of Ramallah, and that the difference in total consumption between the highest value and the lowest value reached

(138.22 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (17.3 degrees Celsius).

In the city of Bethlehem, there was no statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 67.256 + -.044

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (6.39 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (6.49%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value has reached

(64. 94 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (14.7 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 18.268 + -.138

It also appeared through the analysis of the data of this study that the amount of impact of each drop in temperature reached a value of (1.14 MVA) on the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (4.31%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value has reached

(20.51 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (15.3 degrees Celsius).

- Study results: for the winter of 2021: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 599.060 + -28.425

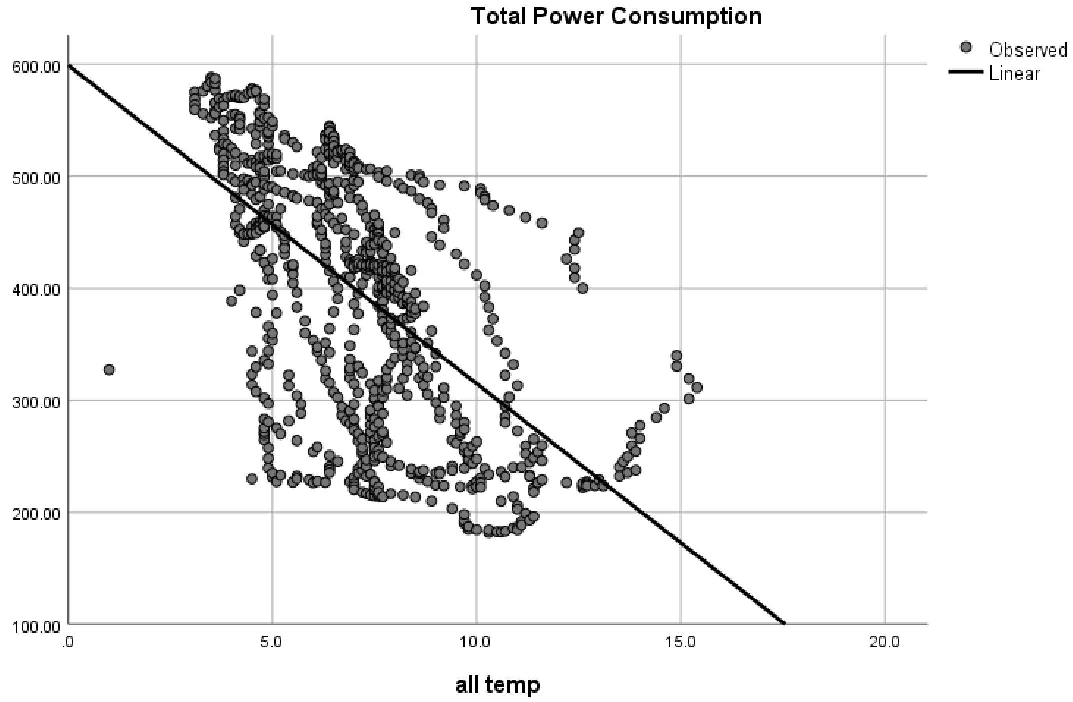

Figure 25 show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (38.21 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (6.49%) and that the difference in the total consumption Between the highest value and the lowest value it reached (406.65 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (14.4 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

$Y = a + b$

$Y = 241.417 + -11.593$

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (15.68 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (6.49%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value reached (175.2 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (12.3 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 215.967 + -9.045

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (15.36 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (6.75%) in the city of Ramallah, the difference in total consumption between the highest value and the lowest value reached (157.82 MVA). It also appeared that the differences between the lowest and highest temperatures reached (11.6 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 97.461 + -4.461

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (7.88 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (7.75%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value reached (67.96 MVA). It also appeared that the differences between the lowest and highest temperatures reached (10.9 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 26.062 + -.618

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (1.02 MVA) on the total consumption, and the percentage of change in the value of the total consumption amounted to (4.27%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value reached (19 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (15.3 degrees Celsius).

- Study results: for the winter of 2022: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 599.060 + -28.425

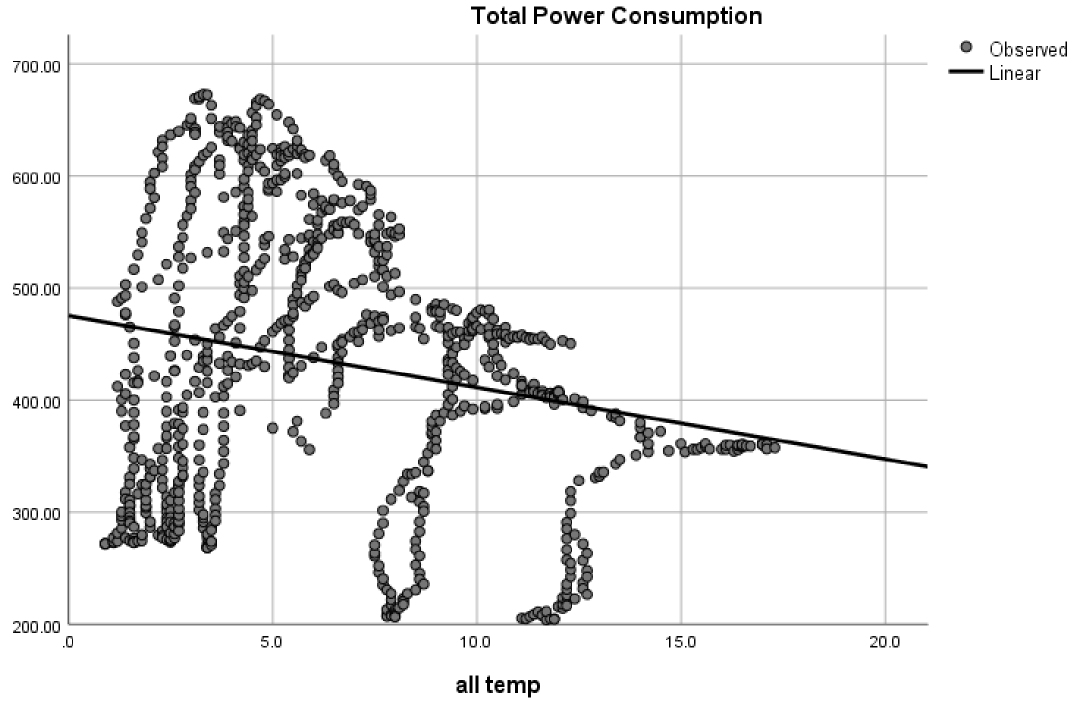

Figure 26 show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (38.21 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (6.49%) and that the difference in the total consumption Between the highest value and the lowest value it reached (406.65 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (14.4 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

Y = a + b

Y = 241.417 + -11.593

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (15.68 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (6.49%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value reached (175.2 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (12.3 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 215.967 + -9.045

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (15.36 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (6.75%) in the city of Ramallah, the difference in total consumption between the highest value and the lowest value reached (157.82 MVA). It also appeared that the differences between the lowest and highest temperatures reached (11.6 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 97.461 + -4.461

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (7.88 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (7.75%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value reached (67.96 MVA). It also appeared that the differences between the lowest and highest temperatures reached (10.9 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 26.062 + -.618

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (1.02 MVA) on the total consumption, and the percentage of change in the value of the total consumption amounted to (4.27%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value reached (19 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (15.3 degrees Celsius).

- Study results: for the winter of 2023: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 441.935 + 9.774

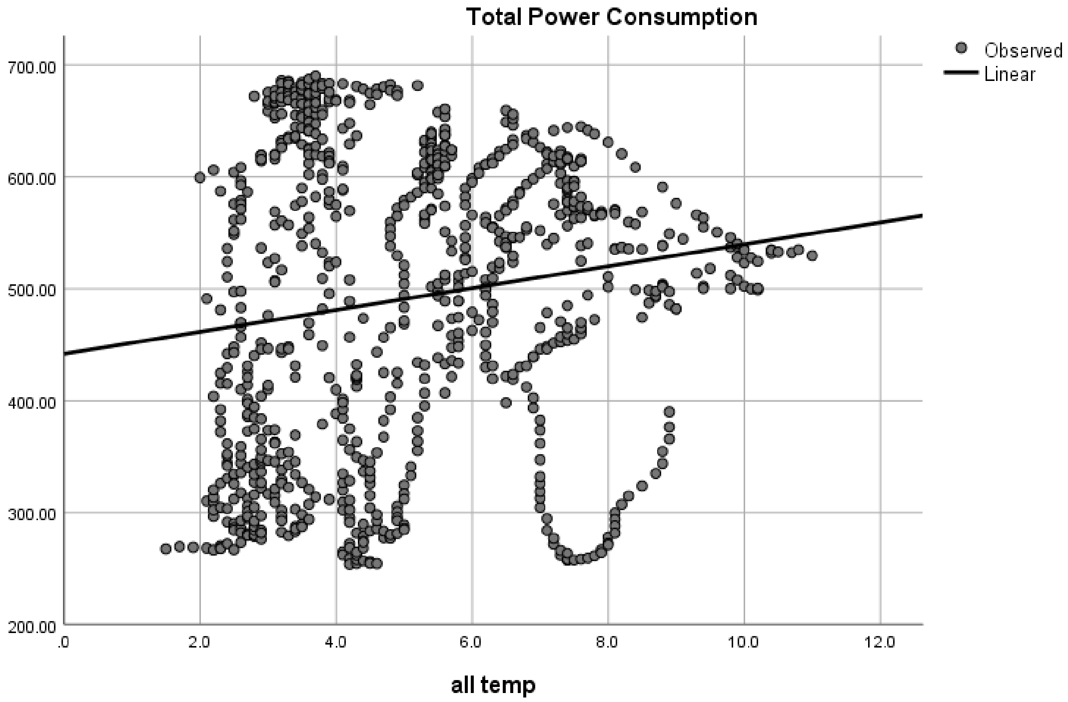

Figure 27 show that There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (62.75 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (9.09%) and that the difference in the total consumption Between the highest value and the lowest value it reached (436.36 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (9.5 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and an equation was as follows:

Y = a + b

Y = 181.769 + 2.343

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (25.24 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (9.09%) in the city of Jerusalem, and that The difference in total consumption between the highest value and the lowest value has reached

(180.27 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(9.5 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 169.154 + 3.894

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (24.26 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (24.26) of the total consumption.

(8.62%) in the city of Ramallah, and that the difference in total consumption between the highest value and the lowest value reached

(188.86 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (10 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 78.396 + 2.336

It also appeared through the analysis of the data of this study that the amount of impact of each drop in temperature reached (13.47 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (10.98%) in the city of Bethlehem, the difference in total consumption between the highest value and the lowest value reached (77.59 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (8.8 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 17.320 + .243

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (1.54 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (5.02%) in the city of Jericho, and that The difference in total consumption between the highest value and the lowest value has reached (17.12 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (11.3 degrees Celsius).

- Study results: For Fridays from the year (2018 - 2023): Summer semesters: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 150.634 + 6.022

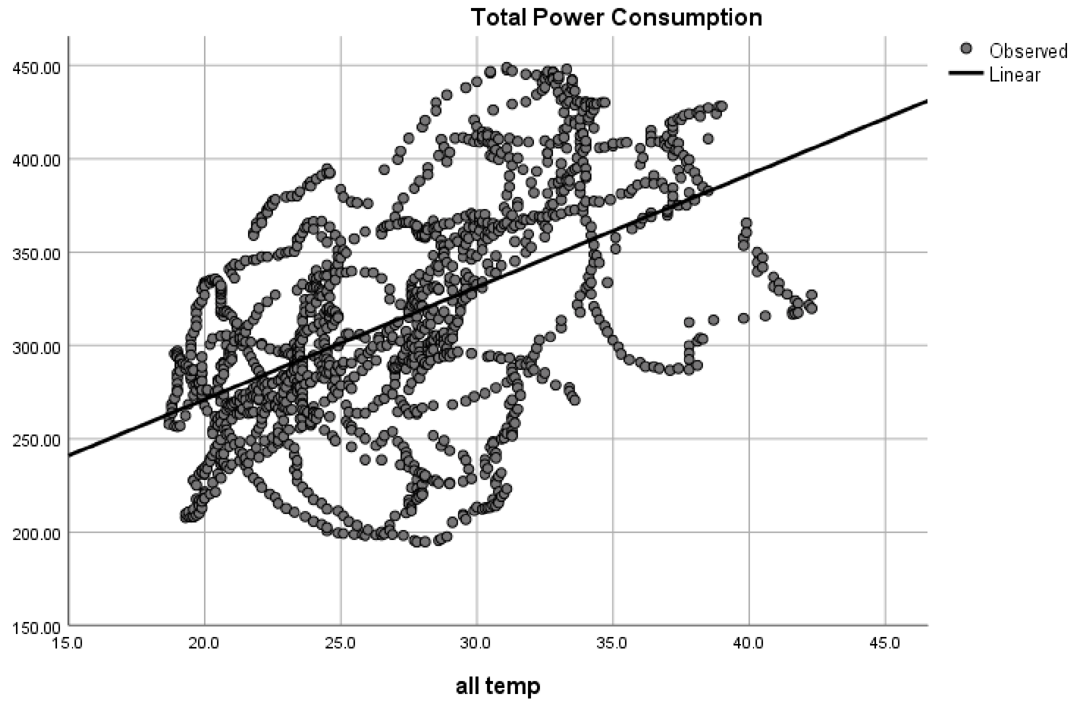

Figure 28 show That There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature increase reached a value of (10.61 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.36%) for Fridays in the summer, and that The difference in total consumption between the highest value and the lowest value reached (254.13 MVA). It also appeared that the differences between the lowest and highest temperatures reached (23.6 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

$Y = a + b$

$Y = 47.135 + 2.300$

It was also shown through the analysis of the data of this study that the amount of impact of each single temperature increase reached a value of (4.10 MVA) on total consumption, and the percentage change in the value of total consumption amounted to (2.36%) for Fridays in the city of Jerusalem. In summer, the difference in total consumption between the highest value and the lowest value reached (108.16 MVA). It also appeared that the differences between the lowest and highest temperatures reached (23.6 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

$Y = a + b$

$Y = 73.998 + 1.516$

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature rise reached a value of (4 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (4 MVA) of the total consumption.

(2.51%) for Fridays in the city of Ramallah in the summer, and the difference in total consumption between the highest value and the lowest value reached (88.36). It also appeared that the differences between the lowest and highest temperature reached a value of (21.3 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 34.726 + .853

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature increase reached a value of (2 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2 MVA) of the total consumption.

(2.57%) for Fridays in the city of Bethlehem in the summer, and the difference in total consumption between the highest value and the lowest value reached (45.32 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (2.22 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 19.019 + .520

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature rise reached a value of (1.26 MVA) of the total consumption, and the percentage change in the value of the total consumption amounted to (2.20%) for Fridays in the city of Jericho. In summer, the difference in total consumption between the highest value and the lowest value reached (41.75 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (71.7 degrees Celsius).

- Study results: For Saturdays from the year (2018 - 2023): Summer semesters:

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 99.184 + 9.009

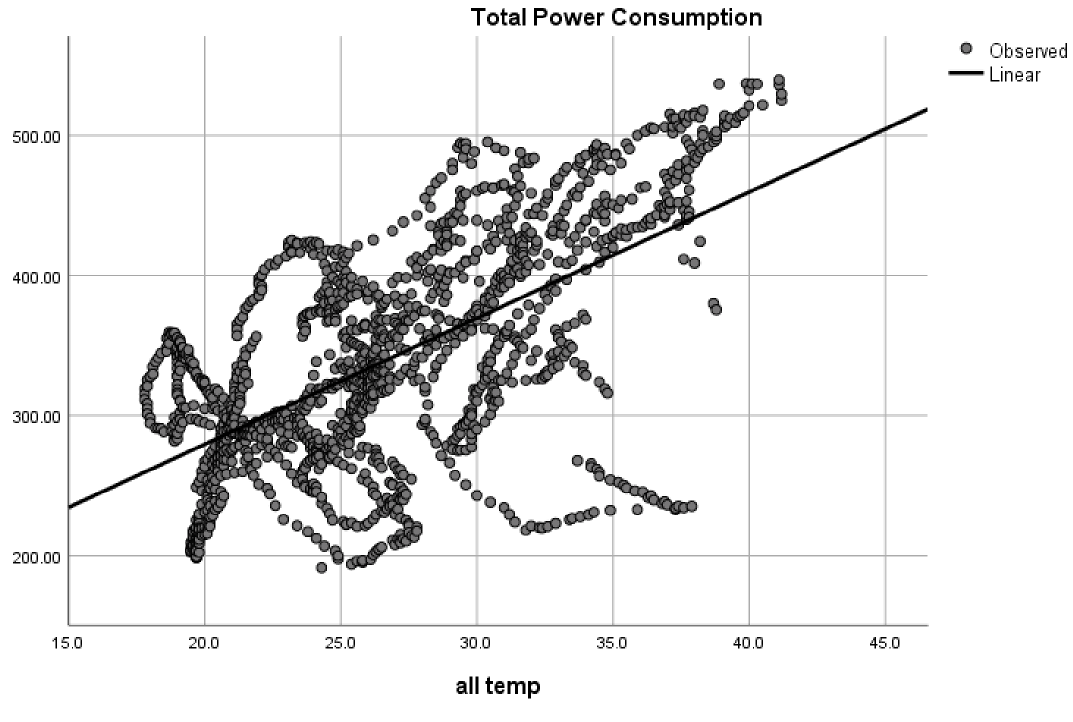

Figure 29 Show That There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature increase reached a value of (13.1 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.42%) for Saturdays in the summer, and that The difference in total consumption between the highest value and the lowest value reached (348.48 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (23.4 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 26.202 + 3.352

It was also shown through the analysis of the data of this study that the amount of effect of each single temperature increase reached (4.72 MVA) of the total consumption, and the percentage change in the value of the total consumption amounted to (2.42%) for Saturdays in the city of Jerusalem. In summer, the difference in total consumption between the highest value and the lowest value reached (139.85 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (23.4 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 64.002 + 2.457

It also appeared through the analysis of the data of this study that the amount of impact for each single temperature increase reached (5.31 MVA) of the total consumption, and the percentage change in the value of the total consumption amounted to (2.62%) for Saturdays in the city of Ram. It is summer, and the difference in total consumption between the highest value and the lowest value has reached (152.87 MVA). It also appeared that the differences between the lowest and highest temperatures reached (4.20 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

$Y = a + b$

$Y = 29.406 + 1.371$

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature increase reached a value of (2.88 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.84%) for Saturdays in the city of Beit. Meat in the summer, and the difference in total consumption between the highest value and the lowest value reached (66.37 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (19.3 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

$Y = a + b$

$Y = 11.848 + .739$

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature increase reached (1.36 MVA) of the total consumption, and the percentage change in the value of the total consumption amounted to (2.18%) for Saturdays in the city of Jericho. In summer, the difference in total consumption between the highest value and the lowest value reached (50.08 MVA). It also appeared that the differences between the lowest and highest temperatures reached a value of (20.1 degrees Celsius).

- Study results: For Sundays of the year (2018 - 2023): Summer semesters: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 84.492 + 9.603

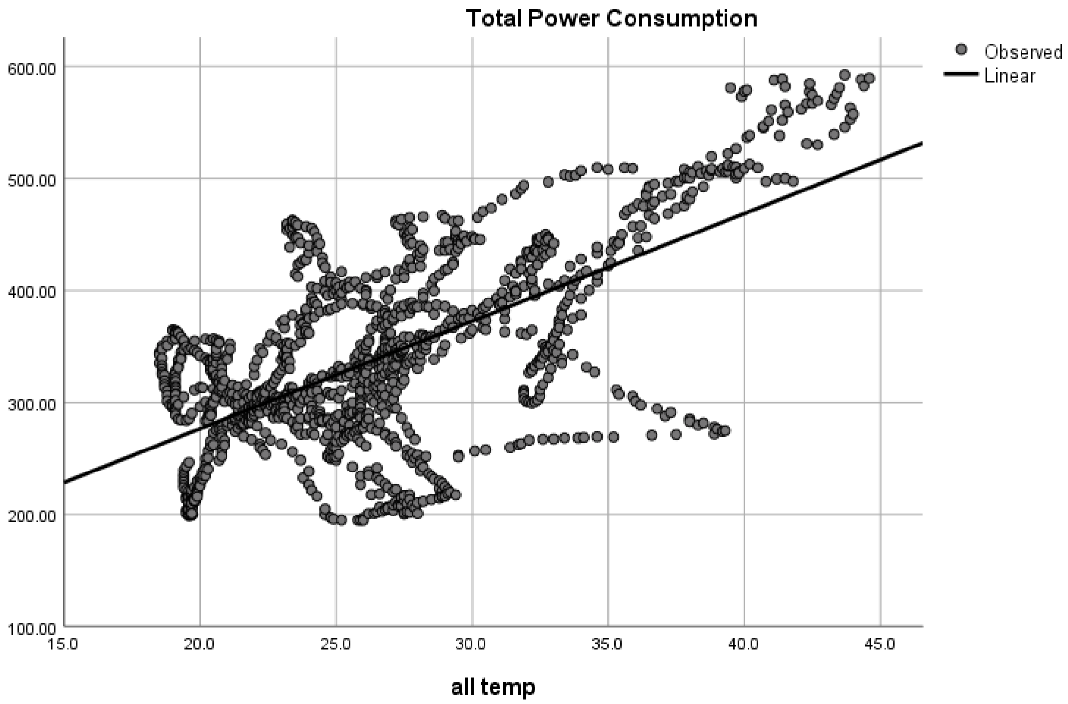

Figure 30 Show That There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each single temperature rise reached a value of (13.28 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.24%) for Sundays in the summer, and that The difference in total consumption between the highest value and the lowest value has reached

(397.59 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(26.1 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 26.507 + 3.277

It was also shown through the analysis of the data of this study that the amount of impact of each single temperature rise reached a value of (4.61 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (2.24%) for Sundays in the city of Jerusalem. In summer, the difference in total consumption between the highest value and the lowest value reached (139.62 MVA). It also appeared that the differences between the lowest and highest temperatures reached (26.1 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 36.784 + 3.770

It was also shown through the analysis of the data of this study that the amount of impact of each single temperature increase reached (6.15 MVA) of the total consumption, and the percentage change in the value of the total consumption amounted to (2.54%) for Sundays in the city of Ram. It is summer, and the difference in total consumption between the highest value and the lowest value has reached (176.76 MVA). It also appeared that the differences between the lowest and highest temperatures reached (21 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 19.850 + 1.723

It also appeared through the analysis of the data of this study that the amount of impact of each single temperature rise reached a value of (2.96 MVA) on total consumption, and the percentage change in the value of total consumption amounted to (2.73%) for Sundays in the city of Beit. Meat in the summer, and the difference in total consumption between the highest value and the lowest value reached (77.61 MVA). It also appeared that the differences between the lowest and highest temperatures reached (20 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 1.500 + 1.016

It also appeared through the analysis of the data of this study that the amount of impact of every single temperature increase reached (1.34 MVA) of the total consumption, and the percentage change in the value of the total consumption amounted to (2.24%) for Sundays in the city of Jericho. In summer, the difference in total consumption between the highest value and the lowest value reached (45.53 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (19.2 degrees Celsius).

- Study results: For Fridays of the year (2018 - 2023): Winter seasons: -

It was found that there was no statistically significant relationship between temperature and the total consumption rate, and the regression equation was as follows:

Y = a + b

Y = 385.258 + .305

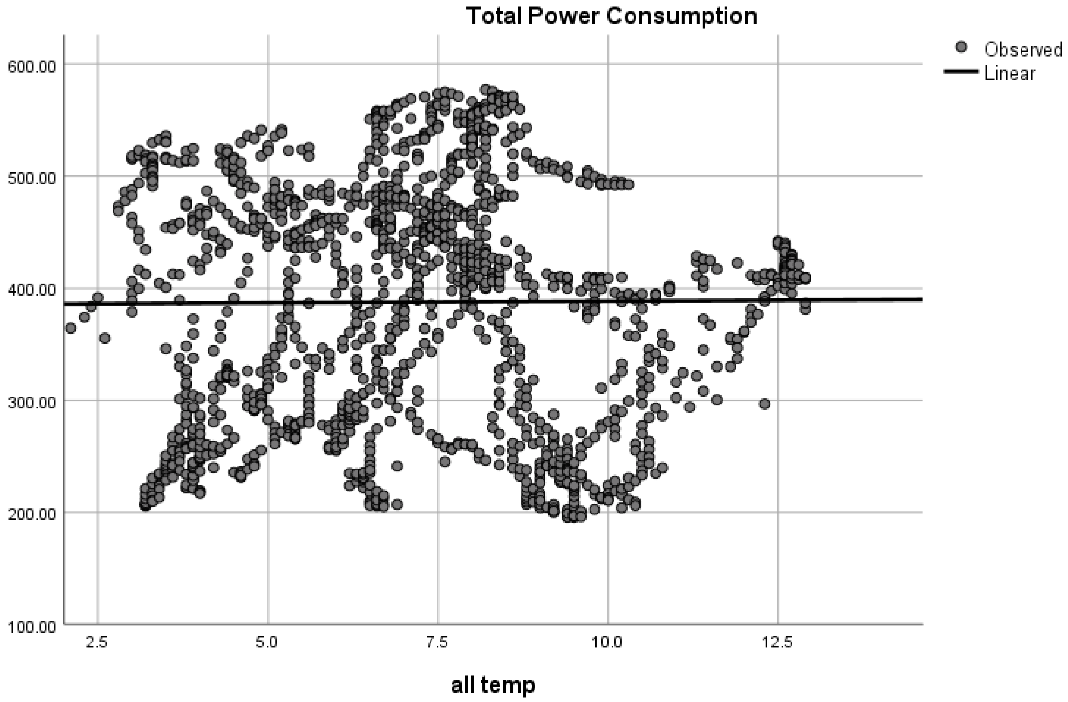

Figure 31 Show That There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (44.73 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (7.75%) for Fridays in the winter, and that The difference in total consumption between the highest value and the lowest value reached (381.65 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (10.8 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was no statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 160.234 + .267

It was also shown through the analysis of the data of this study that the amount of impact of each drop in temperature reached a value of (18.19 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (7.75%) for Fridays in the city of Jerusalem. In winter, the difference in total consumption between the highest value and the lowest value reached (158.96 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (10.8 degrees Celsius).

In the city of Ramallah, it appeared that there was no statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 134.244 + .766

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (16.09 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (7.19%) for Fridays in the city of Ram. It is winter, and the difference in total consumption between the highest value and the lowest value has reached (153.2 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (11.5 degrees Celsius).

In the city of Bethlehem, there was no statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 70.702 + -.207

It also appeared through the analysis of the data of this study that the amount of impact of each drop in temperature reached a value of (9.01 MVA) on the total consumption, and the percentage change in the value of the total consumption amounted to a value of (8.40%) for Fridays in the city of Beit. Meat in the winter, and the difference in total consumption between the highest value and the lowest value reached (72.89 MVA). It also appeared that the differences between the lowest and highest temperatures reached a value of (10.5 degrees Celsius).

In the city of Jericho, there was no statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 16.638 + -.006

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (1.19 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (4.42%) for Fridays in the city of Jericho. In winter, the difference in total consumption between the highest value and the lowest value reached (20.68 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (13.9 degrees Celsius).

- Study results: For Saturdays from the year (2018 - 2023): Winter seasons: -

There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation is as follows:

Y = a + b

Y = 444.039 + -4.750

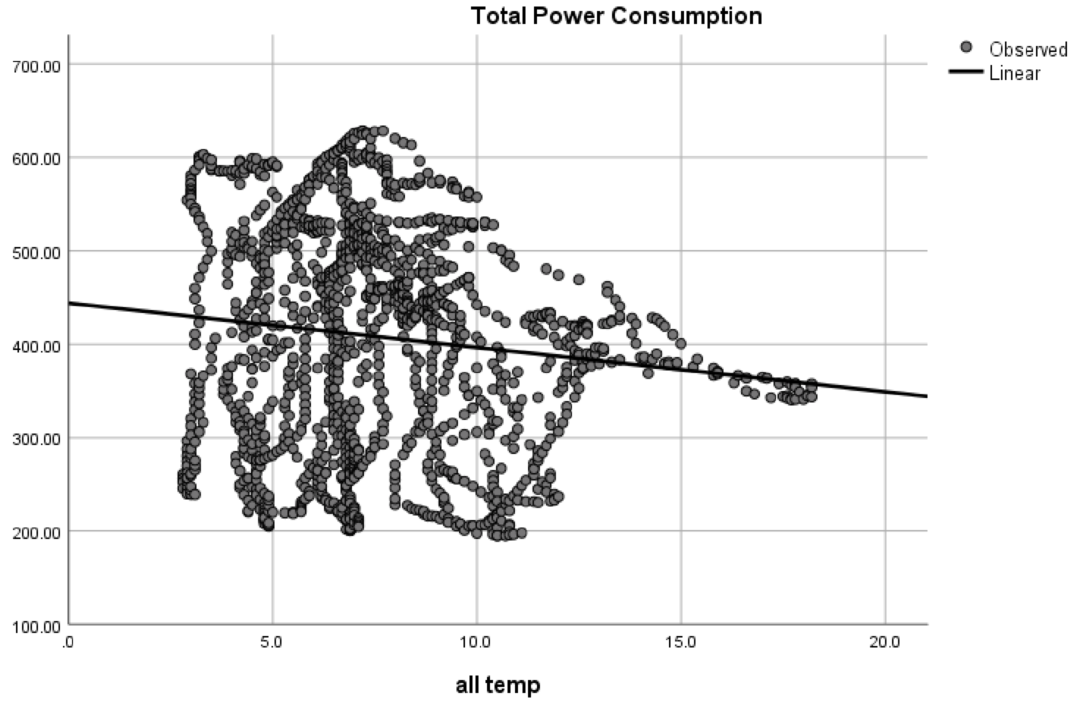

Figure 32 Show That There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (34.53 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (5.49%) for Saturdays in the winter, and that The difference in total consumption between the highest value and the lowest value reached (433.62 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(15.4 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 184.568 + -2.500

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (13.56 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (5.49%) for Saturdays in the city of Jerusalem. In winter, the difference in total consumption between the highest value and the lowest value reached (170.91 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (15.4 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 165.865 + -1.914

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached (13.18 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (5.34%) for Saturdays in the city of Ram. It is winter, and the difference in total consumption between the highest value and the lowest value has reached (177.84 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (15.9 degrees Celsius).

In the city of Bethlehem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 78.741 + -.604

It also appeared through the analysis of the data of this study that the amount of impact of each drop in temperature reached a value of (6.81 MVA) on total consumption, and the percentage change in the value of total consumption amounted to (5.81%) for Saturdays in the city of Beit. Meat in the winter, and the difference in total consumption between the highest value and the lowest value reached (82.99 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (15.8 degrees Celsius).

In the city of Jericho, there was no statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 17.062 + .010

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (1.20 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (4.09%) for Saturdays in the city of Jericho. In winter, the difference in total consumption between the highest value and the lowest value reached (20.47 MVA). It also appeared that the differences between the lowest and highest temperatures reached a value of (15.5 degrees Celsius).

- Study results: For Sundays of the year (2018 - 2023): Winter seasons: -

A statistically significant relationship was found between temperature and the total consumption rate, and the regression equation was as follows:

Y = a + b

Y = 431.212 + -3.675

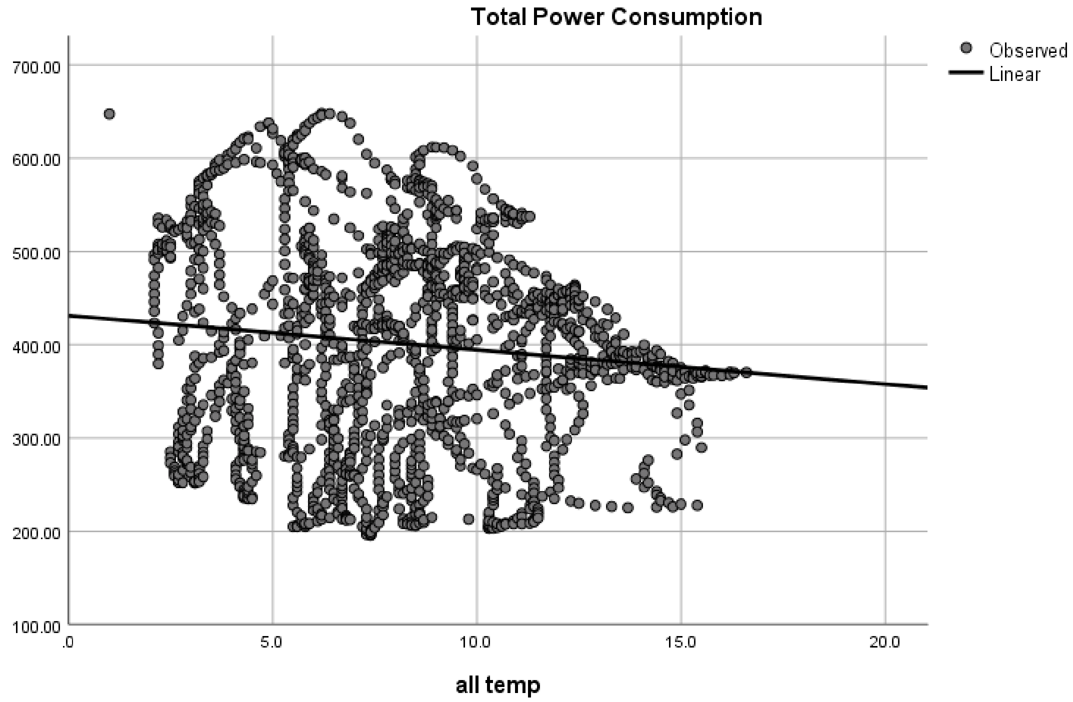

Figure 33 Show That There is a statistically significant relationship between temperature and the total consumption rate, and the regression equation

It also appeared through the analysis of the data of this study that the amount of impact of each drop in temperature reached a value of (39.04 MVA) on total consumption, and the percentage of change in the value of total consumption amounted to (6.02%) for Sundays in the winter, and that The difference in total consumption between the highest value and the lowest value reached (452.53 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of

(15.6 degrees Celsius).

As for the cities specific to this research, the results appeared as follows:

In the city of Jerusalem, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 177.860 + -2.168

It was also shown through the analysis of the data of this study that the amount of effect of each drop in temperature reached (15.26 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to (6.02%) for Sundays in the city of Jerusalem. In winter, the difference in total consumption between the highest value and the lowest value reached (174.29 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (14.5 degrees Celsius).

In the city of Ramallah, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 162.565 + -1.234

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (15.84 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (6.17%) for Sundays in the city of Ram. It is winter, and the difference in total consumption between the highest value and the lowest value has reached (186.71 MVA). It also appeared that the differences between the lowest and highest temperatures reached (15 degrees Celsius).

In the city of Bethlehem, there was no statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 71.420 + .122

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (7.61 MVA) of the total consumption, and the percentage of change in the value of the total consumption amounted to a value of (6.75%) for Sundays in the city of Beit. Meat in the winter, and the difference in total consumption between the highest value and the lowest value reached (77.18 MVA). It also appeared that the differences between the lowest and highest temperature reached a value of (14.5 degrees Celsius).

In the city of Jericho, there was a statistically significant relationship between temperature and consumption rate, and the regression equation was as follows:

Y = a + b

Y = 18.335 + -.075

It also appeared through the analysis of the data of this study that the amount of effect of each drop in temperature reached a value of (1.2 MVA) on the total consumption, and the percentage change in the value of the total consumption amounted to (4.06%) for Sundays in the city of Jericho. In winter, the difference in total consumption between the highest value and the lowest value reached (19.99 MVA). It also appeared that the differences between the lowest and highest temperatures amounted to (17.3 degrees Celsius).

- Summary of results:

Analysis of the results of this study showed that the rate of consumption in the summer is lower than the rates of consumption in the winter across the various school years considered as an academic period in this dimension and as a limitation of this study. It was also shown that the rate of consumption in the winter is greater than the rate of consumption in the summer for all school years considered in this analysis. This has affected the consumption values in all the Palestinian cities that were examined in this research, in addition to the total value therein, even if it differed. To some extent, the city of Jericho is characterized by weather that differs from the rest of the Palestinian cities that were discussed in this study, which are the city of Jerusalem, the city of Ramallah, and the city of Bethlehem. It was also shown that as the temperature of the region increases, electrical consumption decreases, specifically in the winter, such as in the city of Jericho, because The weather here is hotter than in other cities in summer and winter as well.

It has also been shown that the values of the coefficient of determination, or symbolized by the term R squared, refer to the percentage of variance in the dependent variable that can be predicted by the independent variable (or variables), which is known here as the effect of temperature on the value of total consumption (in all Palestinian cities) and detailed, that is, in each Palestinian city there is a school separately, which are the cities of Jerusalem, Ramallah, Bethlehem, and Jericho. It has appeared that the percentage of variation, as was previously indicated, was different in the value of consumption and a value affecting this total and detailed consumption in each city depending on the effect of temperature values. In, addition the annual seasons are divided into the weather in Palestine between winter and summer, as is usual and known in the climate of this country.

The value of the coefficient of determination also showed the percentage of clear effects of temperature in each season on the value of total and partial consumption, and the value of this coefficient (coefficient of determination) also showed the nature of this relationship between temperatures and consumption values, most of which were direct values, meaning that the higher the temperature The value of electrical consumption increases, and this, in turn, affects the rise in the value of electrical costs in electrical energy in each of these cities studied and works to increase the value of the total consumption of electrical energy in society as a whole.

In conclusion, the researcher hopes that he has succeeded in extracting the results of this research, through which he worked to study the effect of the value of rise and fall in temperature on the values of total or partial consumption, and that this research has achieved what the researcher hopes of it from his study of knowing and identifying independent variables. The main dependent variable in this research, and this research should be a new key to conducting other similar research in terms of studying the extent of the effect of temperatures on the values of total and partial consumption of electrical energy.

The following table (5) shows the value of the increase in consumption (MVA) when the temperature rises or falls by one degree Celsius on working days:

Table 5 shows the value of the increase in consumption (MVA) when the temperature rises or falls by one degree Celsius on working days

		Total	Jerusalem	Ramallah	Bethlehem	Jericho
Summer	2018	11.71	3.91	4.62	2.4	0.86
	2019	11.96	4.4	4.79	2.38	0.85
	2020	11.49	4.13	4.5	2.36	0.97
	2021	13.83	4.71	5.33	2.75	1.11
	2022	14.36	4.98	6.08	3.05	1.3
	2023	12.45	4.09	5.99	3.24	1.45
winter	2018	31.55	13.57	11.28	6.76	0.83
	2019	25.24	10.74	9.93	5.03	0.71

	2020	31.28	13.59	12	6.39	1.41
	2021	38.21	15.68	15.36	7.88	1.02
	2022	38.88	15.56	15.6	7.57	1.48
	2023	62.75	25.24	24.26	13.47	1.54

The following table (6) shows the value of the increase in consumption when the temperature rises or falls by one degree Celsius on weekends:

Table 6 shows the value of the increase in consumption when the temperature rises or falls by one degree Celsius on weekends

Summer		Total	Jerusalem	Ramallah	Bethlehem	Jericho
Friday	2018 to 2023	10.61	4.1	4	2	1.26
Saturday	2018 to 2023	13.1	4.72	5.31	2.88	1.36
Sunday	2018 to 2023	13.28	4.61	6.15	2.96	1.34
Winter						
Friday	2018 to 2023	44.73	18.19	16.09	9	1.19
Saturday	2018 to 2023	34.53	13.56	13.18	6.81	1.2
Sunday	2018 to 2023	39.04	15.26	15.84	7.61	1.2

Table (6)

The results show an increase in reliance on electric heating and cooling systems, which increases the pressure on the main supply network.

Chapter 4

Proposed strategies and actions for the energy sector

Proposed strategies and actions for the energy sector based on climate change in the West Bank, to address these challenges, it is crucial to invest in renewable energy sources, implement energy efficiency measures, and develop flexible infrastructure. This includes the establishment of energy storage systems to ensure a reliable energy supply during extreme weather events. Additionally, investing in smart grid technology can enhance energy efficiency and reliability in the region, as evidenced by the following:

4-1 Activating and enhancing the work of senior risk management:

Activating a higher emergency management body that seeks to update the risk map that includes strategies for dealing with disasters and emergencies at the national level. Its work includes multiple financial, administrative, and supervisory powers that enable it to work with ministries and bodies of economy, water, energy, civil defense, health, and other government institutions.

Its work also includes organizing civil society institutions and private sector participation plans in an organized and effective manner to meet the expected challenges.

Activating the work of the senior emergency management aims to comprehensively manage risks in various sectors, centralize coordination and decision-making to respond to disasters, enhance cooperation between ministries and government institutions, and integrate the organized work of the private sector to work within the general plan to confront potential risk challenges.

4-2 Collaboration and Partnerships:

Collaborate with neighboring regions on regional energy projects and share best practices for climate change adaptation.

Action Plan: Connecting power distribution networks at the medium voltage level between companies in the north, center and south of the West Bank, in order to reduce periods of power outages for citizens during crises and emergencies, especially in the areas located between the governorates in the West Bank and faster restoration of electricity services during emergency situations, these two items help achieve the main objective of the study by developing effective adaptation and mitigation strategies

4-3 Strengthening the ability of the electrical power supply network to withstand climate change:

The West Bank is still fed from Israeli connection points due to the lack of a national generation system.

Often, air networks are unable to withstand harsh climatic conditions such as strong winds, storms, and heavy snowfall, and thus malfunctions occur that lead to the interruption of the feeding source.

Adding the main underground feeder lines from the main Israeli supply stations to the main power transmission stations in the West Bank is an important requirement to increase the reliability of the power supply system and reduce errors and interruptions at the main connection points.

Adapting the components of the electrical network to climate change is also an important matter in terms of the ability to withstand changes in temperature and extreme storms, and this contributes to achieving the third sub-objective of the research.

The year 2023 witnessed the beginning of the spread of solar energy stations in the central West Bank with varying production sizes, in addition to the installation of solar energy panels on the roofs of homes and institutions, which operate according to the On

Grid system, where energy production stops when the power from the source is interrupted, in accordance with the strategic plan of the Palestinian Energy Authority. To increase the effectiveness of this trend towards green energy, the following is necessary:

1- Renewing legislation and laws related to renewable energy in accordance with technology related to storage systems and others, in addition to reviewing installation procedures and examining their ability to withstand harsh weather conditions.

2- Increased Focus on Storage Systems as a complementary system to solar energy and to enhance the strategy of reducing dependence on the other side and increasing the reliability of the electrical energy distribution system.

3-Investigating safe options: Exploring regulations and technologies that allow energy production from renewable sources to continue even during external power outages, within public safety measures..

This contributes to achieving the second sub-objective of the research.

Many distribution companies have moved towards introducing smart meter technology into their systems. This technology can be directed to increase energy security and reduce the effects of climate change through the following:

1- Activating the technology to limit consumption in some areas that cause an excessive load on the main networks and feeding lines to avoid cutting off electricity to large areas.

2- Increasing studies on electrical energy tariffs at the national level that determine prices and periods of use through smart meters in a way that achieves the reliability of the electrical system and increases the of the operating periods of renewable energy production, contributes to economic growth and stability, and benefits from fluctuations in temperature during some periods seasons and regions. This contributes to achieving the second sub-objective of the research.

4-4Classification of vital facilities and additional energy sources:

Adopting a special classification for vital facilities in terms of the degree of danger of a power outage, the duration of the outage.

the degree of importance of having an additional source, and the number of additional sources within the laws and legislation is binding on all sectors and institutions. Approval of incentives for modern investment projects such as residential and industrial cities is also considered binding. To provide additional sources to enhance energy security and resilience to climate change.

Expanding the research environment on crisis management and dealing with disasters and emergency situations in a way that suits the special circumstances that the Palestinian people are going through, provided that attention is paid to this research and studies in order to transform them into implementable strategies and policies, as many expectations relate to the issue of future loads. Energy consumption lacks climate factors and their impact on the energy sector.

Conclusion

The results of the study showed the rates of increase in consumption during the maximum consumption periods of the years of study, as in the table (7) below:

Table 7 show the rates of increase in consumption during the maximum consumption periods of the years of study

Year	Per. increase in consumption during summer	Per. increase in consumption during winter
2018	2.72%	6.25%
2019	2.80%	4.65%
2020	2.38%	5.61%

2021	2.80%	6.49%
2022	2.57%	5.78%
2023	2.54%	9.09%
Average	**2.64%**	**6.31%**

Table (4-1)

These results show the necessity of increasing interest in research and studies related to climate change and energy. They also show the importance of dealing with the results and recommendations and turning them into strategies to reduce the negative repercussions of climate change.

Addressing climate change and its impact on energy demand requires collaboration between various sectors and stakeholders, including researchers, policy makers, businesses and communities.

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Appendices

Appendix

Table 8 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the summer of 2018:

	N	Mean	Std. Deviation
all temp	1009	25.246	4.2389
Total Power Consumption	1009	298.7696	55.56604
Jer.Temp.	1009	25.246	4.2389
Jerusalem Branch	1009	98.6376	19.27966
Ram.Temp.	1008	24.494	4.2871
Ramallah Branch	1009	112.5559	22.77347
Bet. Temp.	1009	23.304	4.2734
Bethlehem Branch	1009	55.8890	12.04340
Jericho Temp.	1009	33.556	3.9349
Jericho Branch	1009	31.6842	3.36085

Table 9 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the summer of 2018:

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	.857	.000[b]
Jer.Temp. Jerusalem Branch	.876	.000[b]
Ram.Temp. Ramallah Branch	.804	.000[b]
Bet. Temp. Bethlehem Branch	.726	.000[b]
Jericho Temp. Jericho Branch	.818	.000[b]

Table 10 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the summer of 2019:

	N	Mean	Std. Deviation
all temp	864	25.526	3.9511
Total Power Consumption	864	300.0311	53.14443
Jer.Temp.	863	25.523	3.9519
Jerusalem Branch	864	103.7710	20.01999
Ram.Temp.	861	25.011	4.3190
Ramallah Branch	864	115.6503	22.22592
Bet. Temp.	863	23.790	4.0742
Bethlehem Branch	864	56.6188	11.24433
Jericho Temp.	863	33.444	3.9487
Jericho Branch	864	23.9942	7.10807

Table 11 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the summer of 2019

	Correlation coefficient	Statistical significance
all temp	-.605	.000[b]
Total Power Consumption		
Jer.Temp.	-.565	.000[b]
Jerusalem Branch		
Ram.Temp.	-.655	.000[b]
Ramallah Branch		
Bet. Temp.	-.586	.000[b]
Bethlehem Branch		
Jericho Temp.	-.296	.000[b]
Jericho Branch		

Table 12 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption in the summer of 2020:

	N	Mean	Std. Deviation
all temp	1007	26.978	5.2707
Total Power Consumption	1007	335.3140	68.32418
Jer.Temp.	1007	26.978	5.2707
Jerusalem Branch	1007	115.5670	26.69949
Ram.Temp.	1007	25.539	5.4086
Ramallah Branch	1007	123.7290	26.09202
Bet. Temp.	1007	24.829	4.9830
Bethlehem Branch	1007	60.8914	13.66892
Jericho Temp.	1007	33.654	3.7706
Jericho Branch	1007	35.1334	3.62417

Table 13 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the summer of 2020

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	-.156	.000[b]
Jer.Temp. Jerusalem Branch	-.082	.009[b]
Ram.Temp. Ramallah Branch	-.238	.000[b]
Bet. Temp. Bethlehem Branch	-.228	.000[b]
Jericho Temp. Jericho Branch	-.471	.000[b]

Table 14 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the summer of 2021

	N	Mean	Std. Deviation
all temp	864	28.424	3.9001
Total Power Consumption	864	368.2259	60.58341
Jer.Temp.	864	28.424	3.9001
Jerusalem Branch	864	121.9280	21.94214
Ram.Temp.	864	27.556	4.0500
Ramallah Branch	864	139.3539	23.87381
Bet. Temp.	863	26.721	3.8793
Bethlehem Branch	864	65.9223	12.50718
Jericho Temp.	864	35.151	4.1724
Jericho Branch	864	41.0241	4.35630

Table 15 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the summer of 2021

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	.839	.000[b]
Jer.Temp. Jerusalem Branch	.849	.000[b]
Ram.Temp. Ramallah Branch	.842	.000[b]
Bet. Temp. Bethlehem Branch	.793	.000[b]
Jericho Temp. Jericho Branch	.854	.000[b]

Table 16 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the summer of 2022:

	N	Mean	Std. Deviation
all temp	863	27.665	4.7331
Total Power Consumption	863	398.7389	78.61792
Jer.Temp.	861	27.727	4.5603
Jerusalem Branch	863	132.2982	30.42467
Ram.Temp.	862	25.903	4.3452
Ramallah Branch	863	150.2515	30.94903
Bet. Temp.	863	26.099	3.9977
Bethlehem Branch	863	70.1962	14.31541
Jericho Temp.	863	34.244	3.9586
Jericho Branch	863	45.9914	5.11092

Table 17 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the summer of 2022

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	.788	.000[b]
Jer.Temp. Jerusalem Branch	.752	.000[b]
Ram.Temp. Ramallah Branch	.753	.000[b]
Bet. Temp. Bethlehem Branch	.734	.000[b]
Jericho Temp. Jericho Branch	.796	.000[b]

Table 18 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the summer of 2023

	N	Mean	Std. Deviation
all temp	437	33.105	3.2997
Total Power Consumption	434	386.4021	62.46661
Jer.Temp.	437	33.105	3.2997
Jerusalem Branch	434	121.6890	22.80260
Ram.Temp.	437	23.831	3.6942
Ramallah Branch	435	148.4567	24.17283
Bet. Temp.	437	22.082	3.5727
Bethlehem Branch	434	70.1237	12.10453
Jericho Temp.	437	33.105	3.2997
Jericho Branch	434	46.0727	5.99358

Table 19 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the summer of 2023

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	Correlation coefficient	Statistical significance
all temp	.947	.000[b]
Total Power Consumption		
Jer.Temp.	.942	.000[b]
Jerusalem Branch		
Ram.Temp.	.879	.000[b]
Ramallah Branch		
Bet. Temp.	.894	.000[b]
Bethlehem Branch		
Jericho Temp.	.769	.000[b]
Jericho Branch		

Table 20 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the winter 2018

	N	Mean	Std. Deviation
all temp	1152	9.700	2.2126
Total Power Consumption	1152	353.4224	90.04612
Jer.Temp.	1152	9.700	2.2126
Jerusalem Branch	1152	144.2380	37.87738
Ram.Temp.	1152	9.356	2.3271
Ramallah Branch	1152	130.1085	34.86317
Bet. Temp.	1152	7.806	2.0928
Bethlehem Branch	1152	65.3927	17.09787
Jericho Temp.	796	15.764	2.9364
Jericho Branch	1152	13.6864	2.50072

Table 21 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the winter 2018

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	.182	.000[b]
Jer.Temp. Jerusalem Branch	.060	.040[b]
Ram.Temp. Ramallah Branch	.147	.000[b]
Bet. Temp. Bethlehem Branch	.184	.000[b]
Jericho Temp. Jericho Branch	.396	.000[b]

Table 22 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the winter 2019

	N	Mean	Std. Deviation
all temp	865	10.110	3.8429
Total Power Consumption	865	362.1587	102.12556
Jer.Temp.	865	10.110	3.8429
Jerusalem Branch	865	148.0745	44.79791
Ram.Temp.	865	9.958	4.1433
Ramallah Branch	865	133.9487	39.25233
Bet. Temp.	802	8.375	3.6983
Bethlehem Branch	865	65.8236	17.49432
Jericho Temp.	865	17.974	3.8246
Jericho Branch	865	14.3083	2.66338

Table 23 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the winter 2019

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	-.247	.000[b]
Jer.Temp. Jerusalem Branch	-.358	.000[b]
Ram.Temp. Ramallah Branch	-.235	.000[b]
Bet. Temp. Bethlehem Branch	-.120	.001[b]
Jericho Temp. Jericho Branch	.113	.001[b]

Table 24 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the winter 2020

	N	Mean	Std. Deviation
all temp	864	9.121	4.4156
Total Power Consumption	864	387.2050	97.38621
Jer.Temp.	864	9.121	4.4156
Jerusalem Branch	864	160.7176	41.40786
Ram.Temp.	861	8.819	4.4510
Ramallah Branch	864	143.4015	38.16552
Bet. Temp.	864	7.630	4.3997
Bethlehem Branch	864	66.9173	16.72435
Jericho Temp.	863	15.205	4.1173
Jericho Branch	864	16.1642	3.65418

Table 25 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the winter 2020

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	-.095	.005[b]
Jer.Temp. Jerusalem Branch	-.215	.000[b]
Ram.Temp. Ramallah Branch	-.045	.190[b]
Bet. Temp. Bethlehem Branch	-.012	.732[b]
Jericho Temp. Jericho Branch	-.156	.000[b]

Table 26 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the winter 2021

	N	Mean	Std. Deviation
all temp	858	7.144	2.3211
Total Power Consumption	864	395.7612	111.59808
Jer.Temp.	857	7.151	2.3130
Jerusalem Branch	864	158.4415	45.95822
Ram.Temp.	864	7.386	2.2814
Ramallah Branch	864	149.1581	44.10011
Bet. Temp.	864	5.876	2.3260
Bethlehem Branch	864	71.2470	20.26323
Jericho Temp.	864	14.795	3.3116
Jericho Branch	864	16.9163	3.26610

Table 27 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the winter 2021

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	-.589	.000[b]
Jer.Temp. Jerusalem Branch	-.581	.000[b]
Ram.Temp. Ramallah Branch	-.468	.000[b]
Bet. Temp. Bethlehem Branch	-.512	.000[b]
Jericho Temp. Jericho Branch	-.627	.000[b]

Table 28 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the winter 2022

	N	Mean	Std. Deviation
all temp	864	6.563	3.8538
Total Power Consumption	864	433.4453	122.03693
Jer.Temp.	864	6.563	3.8538
Jerusalem Branch	864	167.9616	48.11880
Ram.Temp.	864	6.460	3.7110
Ramallah Branch	864	166.4172	49.21021
Bet. Temp.	864	5.072	3.8534
Bethlehem Branch	864	78.8439	22.32857
Jericho Temp.	855	14.964	4.6353
Jericho Branch	864	20.2218	4.87894

Table 29 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the winter 2022

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	-.202	.000[b]
Jer.Temp. Jerusalem Branch	-.311	.000[b]
Ram.Temp. Ramallah Branch	-.140	.000[b]
Bet. Temp. Bethlehem Branch	-.100	.003[b]
Jericho Temp. Jericho Branch	-.066	.055[b]

Table 30 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption In the winter 2023

	N	Mean	Std. Deviation
all temp	864	5.074	2.0583
Total Power Consumption	863	491.5071	133.71168
Jer.Temp.	864	5.074	2.0583
Jerusalem Branch	864	193.6551	51.47100
Ram.Temp.	864	5.264	2.0375
Ramallah Branch	863	189.6446	55.29798
Bet. Temp.	864	3.879	1.9619
Bethlehem Branch	864	87.4577	24.26331
Jericho Temp.	864	13.909	2.6865
Jericho Branch	864	20.7046	4.51980

Table 31 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption In the winter 2023

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	.150	.000[b]
Jer.Temp. Jerusalem Branch	.094	.006[b]
Ram.Temp. Ramallah Branch	.144	.000[b]
Bet. Temp. Bethlehem Branch	.189	.000[b]
Jericho Temp. Jericho Branch	.145	.000[b]

Table 32 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption On Fridays in the summer (2018 – 2023)

	N	Mean	Std. Deviation
all temp	1440	27.229	5.3225
Total Power Consumption	1440	314.6202	60.46668
Jer.Temp.	1440	27.229	5.3225
Jerusalem Branch	1440	109.7753	24.12750
Ram.Temp.	1440	25.395	4.9268
Ramallah Branch	1440	112.4995	20.73988
Bet. Temp.	1440	24.425	5.0662
Bethlehem Branch	1440	55.5519	9.83983
Jericho Temp.	1440	34.161	4.2830
Jericho Branch	1440	36.7927	9.35966

Table 33 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption On Fridays in the summer (2018 – 2023)

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	.530	.000[b]
Jer.Temp. Jerusalem Branch	.507	.000[b]
Ram.Temp. Ramallah Branch	.360	.000[b]
Bet. Temp. Bethlehem Branch	.439	.000[b]
Jericho Temp. Jericho Branch	.238	.000[b]

Table 34 Numbers, arithmetic averages, and standard deviations for temperature variables and electrical energy consumption On Saturdays in the summer (2018 – 2023)

	N	Mean	Std. Deviation
all temp	1583	26.679	5.4601
Total Power Consumption	1583	339.5282	79.06047
Jer.Temp.	1583	26.679	5.4601
Jerusalem Branch	1583	115.6372	30.05358
Ram.Temp.	1583	24.794	4.5032
Ramallah Branch	1583	124.9216	29.26832
Bet. Temp.	1583	23.864	4.6749
Bethlehem Branch	1583	62.1234	14.73586
Jericho Temp.	1583	33.839	4.2158
Jericho Branch	1583	36.8473	9.45678

Table 35 The value of the correlation coefficient and the level of statistical significance between temperature variables and the value of electrical energy consumption On Saturdays in the summer (2018 – 2023)

	Correlation coefficient	Statistical significance
all temp Total Power Consumption	.622	.000[b]
Jer.Temp. Jerusalem Branch	.609	.000[b]
Ram.Temp. Ramallah Branch	.378	.000[b]
Bet. Temp. Bethlehem Branch	.435	.000[b]
Jericho Temp. Jericho Branch	.329	.000[b]

الملخص

يواجه استهلاك الكهرباء في فلسطين تحديات كبيرة بسبب العوامل البيئية والاقتصادية. تتناول الدراسة تأثير أنماط الاستهلاك المرتبطة بالحرارة على قطاع الطاقة، خاصة خلال فترات ذروة الطلب في وسط الضفة الغربية .

وباستخدام عينات التباين الأقصى، يفحص البحث العلاقة بين درجة الحرارة واستهلاك الكهرباء. وتشير النتائج إلى متوسط زيادة قدرها 2.64% لكل درجة مئوية خلال ذروة الطلب في الصيف و6.31% لكل درجة مئوية خلال ذروة الطلب في الشتاء.

تساهم هذه النتائج في التخطيط التشغيلي لإدارة الأحمال القصوى وتوجيه الخطط الإستراتيجية لشركات التوزيع وقطاع الطاقة كما تسلط الدراسة الضوء على الحاجة إلى استراتيجيات التكيف لمعالجة آثار تغير المناخ وضمان إمدادات كهرباء موثوقة .

يؤكد البحث المقدم هنا على الدور الحاسم للتخطيط الاستراتيجي في التخفيف من آثار تغير المناخ على قطاع الطاقة من خلال فهم العلاقة بين درجة الحرارة واستهلاك الكهرباء، يمكن لشركات التوزيع وقطاع الطاقة تطوير استراتيجيات أكثر فعالية لإدارة ذروة الطلب وضمان إمدادات الكهرباء الموثوقة.