



جامعة الكويت  
KUWAIT UNIVERSITY

**Research Sector**

Office of the Vice President  
for Research

# Priority Research Areas:

## Cooperation & Partnership

2025



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## Priority Research Areas 2025

Since its inception, the Research Sector (RS) has been committed to encouraging the Faculty Members at Kuwait University towards achieving their scientific and research endeavors and keeping abreast with global scientific developments. The RS provides the support and funding necessary to build a distinguished academic and research career. One major priority of the RS is to address concerns and find appropriate solutions facing the State of Kuwait through high-quality scientific research.

To this end, the RS surveyed KU's academic faculty members and experienced researchers across various state institutions on emerging outstanding challenges and aligning them with Kuwait Vision 2035. Consequently, research priorities were identified and researchers were given incentives and privileges (see Rules and Regulations of Research Support System) to undertake research programs related to these priority areas.

Priority research is conducive for interdisciplinary research bringing together diverse scientific and humanities disciplines to provide practical answers to the challenges facing public and private sectors in the State of Kuwait. By encouraging research in these priority research areas, the RS creates a research environment conducive to exceptional research outputs that can enhance global ranking of Kuwait University.





# I. Energy and its sustainability

## 1. Energy Generation Technology and Optimization

- a) Study the development of renewable energy generation technologies utilizing solar, wind, hydropower, geothermal, or biomass energies.
- b) Energy generation from hydrogen and gases derived from various sources, including organic waste from landfills, wastewater, agricultural waste, and plants.
- c) Improve the efficiency of power plants and systems that utilize solar cells and wind turbines.
- d) Develop of hydrogen production technology of all types, such as: green hydrogen.

## 2. Renewable Energy Storage and Distribution Technologies

- a) Develop and introduce renewable energy storage technologies with an emphasis on sustainability: battery storage, hydrogen storage, and thermal storage.
- b) Improve energy storage capacity and raise its efficiency and production.
- c) Improve programming and integration systems for smart grid systems to achieve greater product utilization, support renewable energy technology, and increase distribution efficiency.
- d) Develop smart grid management and control technologies application, as well as differentiation and integration between production, consumption and distribution in terms of potential, time and space.

## 3. Energy Efficiency

- a) Technologies to increase energy efficiency across various sectors such as transportation, industry, and construction whether private, commercial or investment (carbon neutrality).
- b) Develop energy conservation and demand management technologies.

## 4. Renewable Energy Sustainability

- a) Investigate the environmental, economic, and social effects of energy production and consumption on society and how to minimize them.
- b) Develop recovery and recycling technologies using renewable energy resource.
- c) Investigate technologies for the reduction of harmful emissions in heavy industries.
- d) Investigate and develop low-carbon emission technologies.

# II. Oil and Petroleum Products Sustainability

## 1. Oil and Energy Sustainability

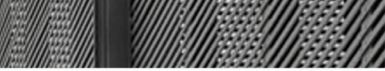
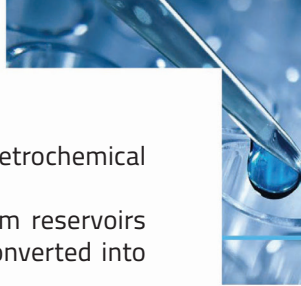
- a) Develop more environmentally sustainable oil and gas extraction technologies and mitigate the negative environmental impacts of various extraction and production processes.

## 2. Exploration, Extraction, and Production Technology

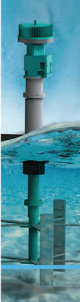
- a) Explore new ways to detect oil and gas reservoirs.
- b) Develop new technologies to extract and produce oil and gas more efficiently, reduce costs and increase production.
- c) Develop new methods to use digital technology to improve oil and gas exploration and production.

## 3. Improving the Quality of Oil and Petroleum Products


- a) Developing technologies that contribute to improving the quality of oil and its derivatives and reducing the emission of harmful gases such as  $\text{NH}_3$ ,  $\text{H}_2\text{S}$ ,  $\text{CO}_2$ .
- b) Improving the quality of oil and its derivatives by removing sulfur, nitrogen and minerals, especially chemically complex ones, which need special conditions to be removed, treated, and reduced.

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- c) Enhancing the production of derivatives and petrochemical products with latest technologies.
  - d) Conversion of extracted oil and gas products from reservoirs into primary/intermediate derivatives and then converted into final petrochemical products.

#### 4. Supply Security and National Dependency


- a) Understand how to secure the supply of oil, gas, and various derivatives such as clean diesel for neighboring countries, countries of the region and geographically distant countries and planning for diversification in energy sources.
  - b) Develop policies and laws that enhance supply, national dependence and solve geopolitical problems.
  - c) Research and development in the field of improving the storage, transportation and distribution of oil and gas.
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#### 5. Environmental Problems and Sustainability

- a) How to deal with environmental challenges associated with the oil and gas industry and develop more scientifically sustainable practices or enact new laws.
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### III. Sustainable Development and Environmental Conservation

#### 1. Waste Treatment

- a) Using biological treatments to eliminate oil and environmental pollutants.
  - b) Developing digital technology to address environmental issues to enhance sustainability and prevent and control pollution.
  - c) Waste recycling and hazardous materials management through developing strategies and technologies.
  - d) Practicing environmental ethics and legislation.
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## 2. Aquatic/Marine Environment

- a) Studying areas vulnerable to inundation due to climate change and impacted by floods resulting from rainfall.
- b) Exploring optimal solutions and practical techniques for treating and disposing of high salinity water.
- c) Inventing new water desalination technologies, enhancing current methods, and promoting the use of environmentally-friendly fuels.
- d) Applying and improving technologies for treating wastewater from domestic and industrial use.
- e) Utilizing biochar for treating polluted water.
- f) Monitoring and improving water quality.
- g) Investigating the impact of various pollutants, both direct and indirect, on the marine environment. Assessing the cascading effects on complete ecosystems, food webs, and their influence on the health of marine organisms, and on humans.
- h) Developing new and rapid impact methods utilizing both biological and non-biological indicators to trace pollutant sources, assess their transport and transformation in the marine environment, in order to evaluate the health of marine ecosystems.
- i) Studying the effects of climate change on sea dynamics, including circulation patterns and water movement horizontally and vertically. Assessing its impact on coastal areas, particularly in the Arabian Gulf and other oceans. Evaluating how these changes affect water characteristics in the marine environment, the distribution of species, and migration patterns.
- j) Investigating the impact of sea-level rise due to climate change on the dynamics of nearshore regions. Evaluating coastal erosion rates, beach retreat, and analyzing the interaction between waves and nearshore environments to understand coastal evolution.
- k) Investigating and assessing the impact of sediment transport in coastal areas on coastal morphology.
- l) Studying the influence of climate change on major atmospheric oscillations (such as the North Atlantic Oscillation - NAO, Indian Ocean Dipole - IOD, and El Niño-Southern Oscillation - ENSO) and their effects on global climate patterns.





### 3. Infrastructure and Modernization

- a. Study of the railway network project.
- b. Study of the metro project.
- c. Improving roads and traffic network.

## IV. Health and Biomedical Sciences

### 1. Chronic Non-communicable Diseases of National Priority

Includes only cardiovascular diseases, obesity, cancer, and the respiratory system. The focus is purely on studying their clinical and epidemiological properties, genetic factors, and molecular foundations that relate to strategies for developing methods for early detection as well as developing plans to control and prevent them at the national level. Research and studies involve live human samples, tissue culture, or laboratory animals.

#### a) Cardiovascular diseases:

- Acute coronary syndrome.
- Heart failure.
- Valvular heart disease.
- Myocardial hypertrophy

#### b) Cancer:

- Breast cancer.
- Cancers of the reproductive organs including ovaries, uterus, vagina, and prostate.
- Colorectal cancer.
- Blood cancer.
- Pharmacogenomics and precise and individualized diagnosis.

#### c) Respiratory diseases:

- Asthma.
- Chronic obstructive pulmonary disease COPD.

#### d) Metabolic disorders:

- Type 2 diabetes.

- Fat imbalance.
- High cholesterol.
- Studies of childhood and adolescent obesity and type 2 diabetes.
- Studies of various obesity treatments, the hormonal and brain association with surgeries and drug treatments, and their impact on the medical economy.

#### e) Diseases associated with genetic factors:

- Type 1 diabetes.
- Thalassemia.
- Autoimmune diseases (Lupus, Psoriasis, Multiple Sclerosis MS)
- Study of liver fat causing hepatitis and cirrhosis, genetic and epigenetic correlation in Kuwait and the Gulf, and therapies that prevent and treat liver fats and hepatitis.
- Link gene therapy with genetic diseases.
- Prevent recessive genetic diseases (premarital genetic testing.)
- Detect, classify, and analyze new genetic traits.
- Detect the genetic factors for congenital malformations of fetuses and their association with environmental factors.

## 2. Mental Illness

- a) Psychological intervention for patients with addiction
- b) Psychological intervention for diabetic patients.
- c) Psychological intervention for with obesity.
- d) Psychological intervention for patients with ADHD and Autism.

## 3. Public Health of National Priority

- a) Prevalent and emerging pandemics that threaten human health, such as coronavirus and influenza.
- b) Prevalent and emerging pandemics that threaten food safety and food security, such as foot-and-mouth disease, bluetongue, and tuberculosis.
- c) Antibiotic resistance phenomena.
  - i. Focus on studying its epidemiological characteristics to develop programs to control and prevent it at the national and regional levels.



## 4. Computational Medicine and Bioinformatics


It purely includes studying feasibility strategies for developing large health databases and their digital transformation, the use of computational medicine and artificial intelligence therein, developing all types of epidemiological investigation programs to help decision-making in the health system and community health at the national and regional levels, in addition to creating genetic databases and analyzing them using bioinformatic methods.

## 5. Unified Environmental Health

It includes studying the various factors specific to the State of Kuwait, including the present and climate change, which directly and indirectly affects the health of the society and the quality of life of individuals. The main focus is on developing long term strategies for health, social and political adjustment, and developing solutions to reduce their risk and support decision making.

# V. Food Safety

## 1. Fisheries and Blue Food

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- Assess and study fish stocks and develop strategies for sustainable and ecosystem-friendly fishing management.
  - Assess the environmental impact of fishing practices on the marine environment and investigate the environmental consequences of overfishing.
  - Analyze sustainable practices in marine aquaculture.
  - Study the environmental and economic effects of different aquaculture practices and evaluate the future of blue sea food production using omics science to ensure food security in developing countries.

## 2. Increase Food Production for Local Markets

- More resilient and sustainable agricultural systems.
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- b) Develop desert lands for agriculture.
- c) Farming techniques for food and soil treatment applications.
- d) Enhance the strategic stock of food products and commodities as well as raw materials for agricultural production and animal feed.

### **3. Assess the Interconnection between Food and Energy in Kuwait Providing Options for Dealing with it**

- a) Transform food waste and leftovers into valuable and useful materials.
- b) Use food waste as an energy source.
- c) Manufacture nutrients and medicines out of food and industrial waste.

### **4. Update Control Systems and Policies and Apply Science-based Methods**

- a) Study and evaluate national veterinary capabilities and how well they can control endemic and transboundary animal diseases.
- b) Control of genetically modified foods to ensure safety.
- c) Control and regulate "Novel Food".
- d) Regulate the "Halal" food system.
- e) Analyze food and food products to ensure their safety, authenticity, and compliance with regulations and laws in terms of chemical, biological, and microbiological aspects in order to detect contamination, adulteration, and fraud.
- f) "Food authenticity" to verify that food products are exactly as they are labeled. Investigate any mislabeling, fraud, or adulteration of food items like spices, oils, and dairy products.

### **5. Restructure the Direct and Indirect Financial Support Systems Provided to the Agricultural Sector**

Reconsider the policies of agricultural support provided to the plant production sector and the livestock and fisheries sectors and reform them in accordance with a set of strategic objectives consistent with the requirements of the food security system.



## 6. Analyze Data and Develop Decision - Making Support Systems

Collect and analyze data and statistics related to the food security system, develop performance measurement indicators for the implemented programs and projects, and establish a comprehensive and integrated geographical information system to support decision-making particularly in times of crisis.

## VI. Education

### 1. Education Reform and Development

- a) The Governance of the educational system.
  - National standards for education and their performance indicators.
  - Kuwait's participation in TIMSS tests.
  - National Tests and developing the educational system.
  - Invest in the STEM program and the quality of the educational process outcomes.
- b) Reform of Public schools.
- c) Diversify education opportunities for: gifted individuals, groups with special needs, and the elderly.
- d) Review teacher preparation programs in the College of Education in the State of Kuwait.
- e) College of Education's internal and external competence.
- f) Performance-based assessment.
- g) Sustainable development, creativity, and innovation within the learning environment.

### 2. Artificial Intelligence and Educational Data Science

- a) Artificial intelligence applications and the educational process.
- b) Artificial intelligence and educational measurement and assessment methods.
- c) Data science in the development of the educational process.



### **3. Knowledge Economy, Research, Creativity, and Innovation**

- a) Education, knowledge economy, research, creativity, and innovation.
- b) Education system and preparing graduates for the labor market.
- c) Data science and transitioning to knowledge economy.
- d) The quality of human capital in the public and private sectors.
- e) Linking the needs of the labor market with the educational outcomes and providing solutions.


### **4. Prospective Studies on the Role of Education under Crises and Challenges**

- a) Responding and adapting to natural disasters and political and economic crises.
- b) Flexible educational environments under disasters and crises.
- c) The impact of disasters and crises on the mental and psychological health of teachers and students.


## **VII. Sustainability of Kuwait Economy**

### **1. Diversification and Sustainability of Economy**


- a) Diversification alternatives for Kuwait economy for the next two decades and economic growth rates for the Gross Domestic Product of private and public sectors. This includes developing the business environment and studying the different areas of entrepreneurship and innovation, digital transformation of organizations, automation, investment in information technology, digital innovations, value creation processes, the impact of artificial intelligence on organizations and companies, as well as research on independent business economics (Gig Economy).
- b) Studying main elements for the sustainability of non-oil Kuwait economy, considering changing in the world's perception of the image of Kuwait.
- c) Develop economic infrastructure by studying the entrepreneurship environment and its development and the incentive system in Kuwait economy.

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- d) Identify potential scenarios to deal with oil shocks and evaluate their effectiveness through developing applied macroeconomic models for economic forecasts and creating updated economic databases to serve these models in order to help decision makers understand the available alternatives to optimize decision making.
  - e) Study how to attract foreign investments to the national economy in the targeted growth areas of economic sectors.

## 2. Public Finance Reform

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- a) Identify best practices in fiscal control measures and adopt innovative solutions to deal with the public debt and the increasing financial pressure resulting from the continuous subsidizing for government services below the real cost such as electricity and water.
  - b) Support public revenues through taxes and surplus recirculation.
  - c) Control public expenditures by identifying ways of selecting subsidies, curbing overspending, and collecting real cost of services.
  - d) Evaluate alternatives for funding budget deficit and determine the optimal mix for financing the deficit through surpluses, public debt instruments funded either locally or internationally.

## 3. Public Sector Reform

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- a) Devise potential methods for dealing with the unsustainable magnitude and growth of public sector wages and its negative impact on future generations, achieve performance management through linking incentives with actual performance, and design a performance management system that aligns the goals of Kuwait Vision for 2035, its strategies, and strategic objectives with performance indicators as well as initiating an effective incentives system for public-sector employees.
  - b) Studying the “Governance Gap” which is the difference between the inputs and outputs of the public sector in terms of performance and productivity.
  - c) Study the improvement in preventing administrative corruption in the public sector, and the added value of all types of oversight

- bodies on the quality of administrative decision. Study how to develop internal audit departments in the public and private sectors and enhance the skills of their employees. In addition, develop and apply the concept of “Value-Added Audit” to include financial and economic auditing and objectives review.
- d) Measure the results of promoting integrity practices in the public sector.
  - e) Determine the role of obstructive bureaucratic culture in public administration and its impact on economic growth in the private sector.

#### 4. Labor Market Reform

- a) Identify potential alternatives to deal with structural imbalances of the labor market in the public and private sectors.
- b) Performing development and enhancement studies focusing on the productivity levels of workers in various economic sectors, and on the development of logistics services locally and internationally.
- c) Encouraging entrepreneurship through studying citizen’s attitudes towards starting new businesses, developing the social desire for entrepreneurship, and identifying how R&D expenditure impacts the number of patents in the Gulf countries to understand how to incentivize innovation.
- d) Measure foreign workers’ quality variability and its direct and its indirect impact on local production competitiveness in the private sector.
- e) Identify better alternatives to the “Sponsorship” system for foreign workers for better recruitment and curbing the illegal residency trade abusive practices.
- f) Develop the domestic labor market, identify the determinants of stability of domestic labor work among heads of household, systematically monitoring worker-employer satisfaction levels while eliminating potential conflicts, and preserve the rights of domestic workers and their employing families to achieve their objectives.



## 5. Redress Population Imbalances

- a) Assess the effects of alternative immigration control regulations intended for solving population imbalances to help decision makers understand the consequences of alternatives on labor supply and demand in economic sectors.
- b) Study the demographic characteristics of the population and their impact on labor supply in different sectors, employment needs, and family support rates.
- c) Study Kuwaiti population cohorts, identify their general characteristics, and job creation and investment opportunities to accommodate their economic, social, and health service>s needs.
- d) Enhance life quality and social safety network for special needs groups and provide the economic inclusion to harness their talents.

## VIII. Contemporary Social and Political Issues in the Kuwaiti Society

### 1. Violence and Bullying

- a) Domestic violence:
  - A comprehensive survey intended to investigate domestic violence rates in Kuwaiti families, including physical, mental, and sexual abuse, and identifying patterns and risk factors.
- b) School violence and bullying:
  - Study the impact of education quality (teaching method, curricula, school activities, and teacher-student relationship) on school violence.
  - Develop and assess innovative strategies to prevent and deal with bullying in schools with emphasis on behavioral and educational interventions.
  - Investigate the long-term impact of school violence on the mental health, academic achievement and social development of victims and offenders.

c) Community violence:

- Human trafficking, sexual harassment, violence among teenagers and young adults.

## 2. Impact and Awareness of Sexual Diseases

- a) The media role in educating individuals about sexually transmitted diseases.
- b) Stigmatization and discrimination towards patients with sexually transmitted diseases.
- c) Attitudes and beliefs of healthcare providers towards people with sexually transmitted diseases.

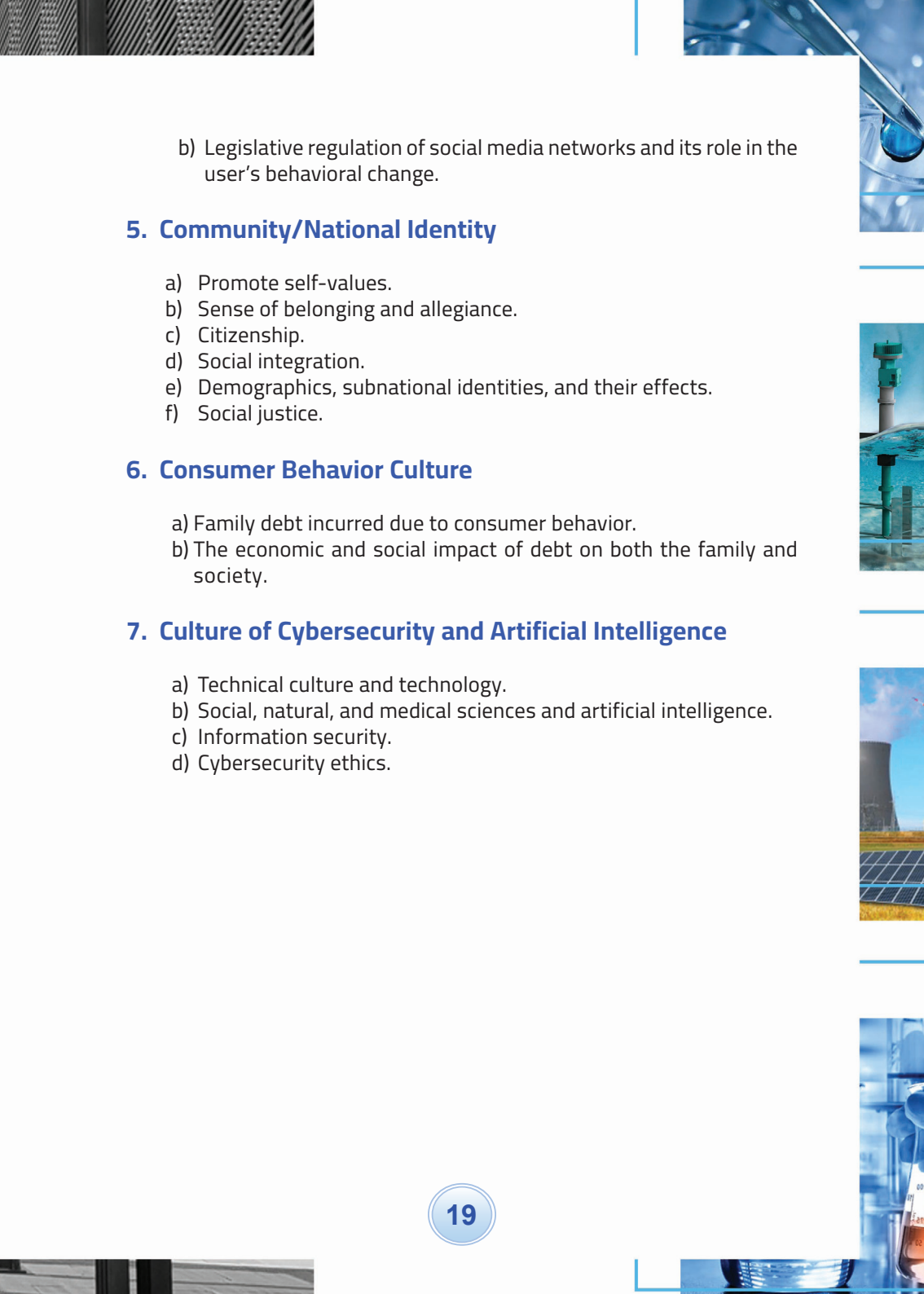
## 3. Drugs and Alcohol Addiction

- a) Hair analysis to detect drugs, medications, and their receptors in hair samples to assess long-term drug abuse in order to prove drug abuse even after a period of time as well as its importance in detecting drug abuse in the workplace.
- b) A survey of the prevalence and types of drug abuse among Kuwaiti young adults (especially in schools and universities), including contributing factors such as social pressure, mental health problems, and ease of accessibility.
- c) Evaluate the success rates of addiction treatment and rehabilitation programs currently in Kuwait, including barriers to access and completion.
- d) Study how cultural and religious beliefs in Kuwait affect perceptions of addiction and the recovery process.
- e) Evaluate awareness programs in the Kuwaiti media related to the field of addiction and drug abuse and available treatment resources.

## 4. The Effects of Social Networks and Media on Social Culture

- a) The impact of social media networks on the behavior and thoughts of individuals, lifestyle, and societal security.



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- b) Legislative regulation of social media networks and its role in the user's behavioral change.

## 5. Community/National Identity

- a) Promote self-values.
- b) Sense of belonging and allegiance.
- c) Citizenship.
- d) Social integration.
- e) Demographics, subnational identities, and their effects.
- f) Social justice.

## 6. Consumer Behavior Culture

- a) Family debt incurred due to consumer behavior.
- b) The economic and social impact of debt on both the family and society.

## 7. Culture of Cybersecurity and Artificial Intelligence

- a) Technical culture and technology.
- b) Social, natural, and medical sciences and artificial intelligence.
- c) Information security.
- d) Cybersecurity ethics.