United Nations | UN WATER

Water for Peace

World Water Day 2024

جامعة نجران

NAJRAN UNIVERSITY

كليـــة الهندســـة

تقريراليوم العالمي للمياه في 22 مارس 2024

كلية الهندسة

قسم الهندسة المدنية

جامعة نجران
NAJRAN UNIVERSITY

تحت رعاية رئيس جامعة نجران

أ.د. عبدالرحمن بن إبراهيم الخضيري

معرض اليوم العالمي للمياه

وزارة البيئة والمياه والزراعة
Ministry of Environment Water & Agriculture
غرفة نجران
شركة المياه الوطنية
National Water Company
UN WATER
United Nations
نقي
NAQI
نجران

الجهات المشاركة

- أمانة نجران
- فرع وزارة البيئة والمياه والزراعة
- شركة المياه الوطنية
- الغرفة التجارية
- جمعية جاتن (التاريخ والاثار بمنطقة نجران)
- جمعية نجران الخضراء
- جمعية رعاية
- شركة مياه نجران المشاركة والتبرع بتوزيع عبوات مياه صحية مجانية للمجتمع المحلي
- شركة نبع نجران المشاركة والتبرع بتوزيع عبوات مياه صحية مجانية للمجتمع المحلي
- شركة نقي.

المشكلة

تشهد المملكة العربية السعودية زيادة كبيرة في عدد المنشآت الصناعية
و زيادة كبيرة في كميات المخلفات الصناعية، خاصة مياه الصرف الصناعي

سجلنا طريقة المعالجة كبراءة
اختراع أمريكية - 8 أغسطس 2023


(12) United States Patent
Alsaiari et al.
(10) Patent No.: US 11,717,810 B1
(45) Date of Patent: Aug. 8, 2023

- كميات ضخمة من المياه
- تأثير خطير على البيئة
- المعالجة معقدة ومستهلكة للطاقة
- الالتزام بالتشريعات يمثل تحديا

الحل

إنتاج حفاز ضوئي مبتكر
لمعالجة مياه الصرف الصناعي

-توفير منتج فعال
اقتصادي-مستدام

فريق العمل


د/مبخوت الصيعري
الرئيس التنفيذي


أ.د/فريد أبوراجح حراز
المسؤول الفني


د/موهد فيصل
كبير الباحثين

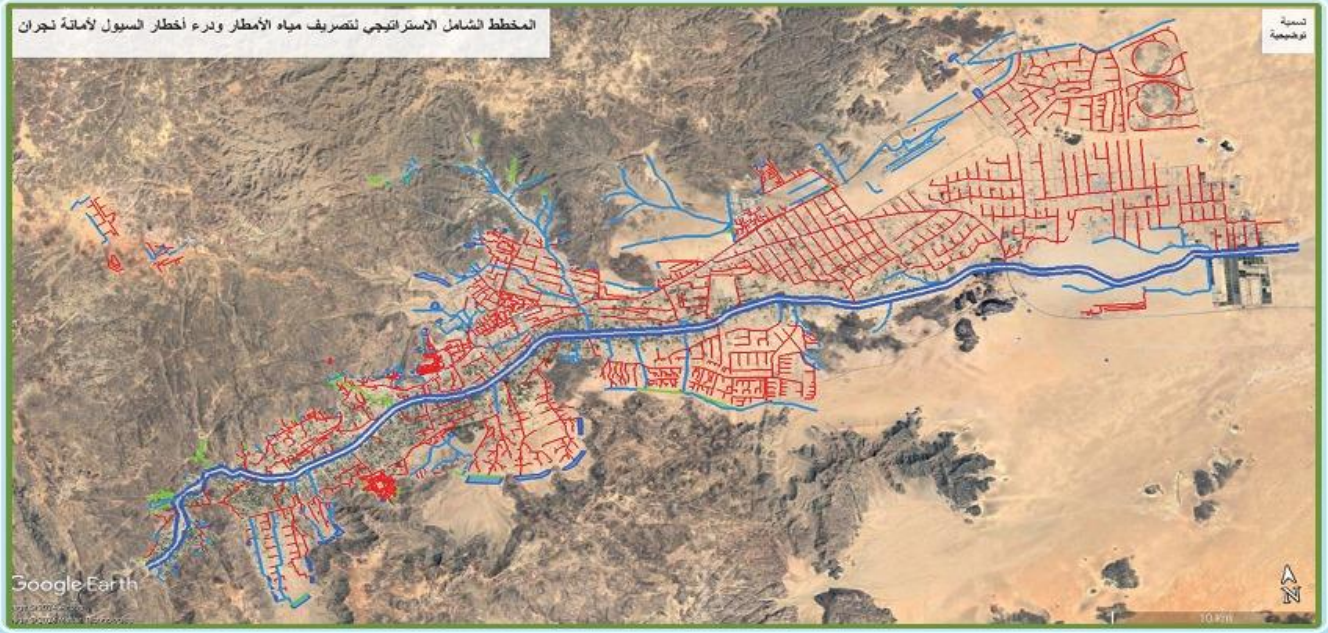

أ/صالح آل عباس
مسؤول الشؤون الفنية


م/ أحمد الهجري
هندسة كيميائية


أ/ محمد المالكي
فنى مختبر


أ/ محمد آل هتيلة
فنى مختبر

أمانة منطقة نجران



أهم عناصر مخرجات المشروع

- بحيرات تهدئة
- شبكة مواسير
- قنوات ناقلة
- جدران حماية
- عقوم خرسانية وترابية
- عبارات أسفل الطرق

شركة المياه الوطنية بمنطقة نجران

شركة المياه الوطنية
National Water Company

مياه		صرف صحي
63,270	عدد التوصيلات المنزلية	17,808
4,924 كم	إجمالي أطول الشبكات	1495 كم

محطات معالجة الصرف لصحي

عدد (3) محطات معالجة ثلاثية بنجران شرورة الوديعة بسعة تصميمية (80,000) م٣/يوم وكميات تدفق (20,300)م٣/يوم سنة 2023 م.

توزيع المياه

- يتم توزيع كميات مياه بإجمالي (86,840)م٣/يوم بمنطقة نجران من خلال شبكات المياه القائمة وبكميات توزيع بقرابة (67,398)م٣/ يوم . كما يتم توزيع المياه من خزانات التجميع ومحطات التوزيع القائمة بعدد (26) محطة توزيع بطاقة توزيع يوميا تقدر بحوالي (15,686) م٣/يوم بالإضافة إلى كميات التوزيع من خلال عقود السقيا بكمية تقدر بحوالي (3,756) م٣ / يوم.
- مصادر الإمداد الحالية (حقل النقيحاء-السد الجوفي بالصفاء-حقل آبار شرورة حقل آبار الوجيد)
- مخطط تنفيذ عدد (25) خزن استراتيجي بسعة (1,315,000) م٣/٧ أيام للعام 2030م.

الاحتياج المائي ٢٠٢٣م

- يقدر بحوالي (231,957) م٣ /يوم
- مخطط تنفيذ عدد (120) مشروع بالمحفظة العشرية بمنطقة نجران حتى العام 2030م، بعدد (56) مشروع صرف صحي، وعدد (64) مشروع شبكات مياه.

تعداد السكان
653,400

عدد المحافظات
7

تغطية شبكة المياه
86K (%58,05)

تغطية شبكة الصرف
(%16.35)

بعد المشاريع تحت التنفيذ(%63.55) 9K
بعد مشاريع الحزمة الأولى(% 66.30) 8K
103K

بعد المشاريع تحت التنفيذ المنتهية (%37.1)
بعد مشاريع الحزمة الأولى (%40)

بالعام 2030 م المحفظة العشرية

2,740 كم 42,200 توصيلة
% 100

3,740 كم 68,900 توصيلة
% 95

الغرفة التجارية الصناعية بمنطقة نجران

غرفة نجران
NAJRAN CHAMBER

الرؤية والرسالة

رؤية الغرفة

اقامة مجتمع اعمال فاعل ومتطور في ظل اقتصاد تنافسي مستدام

رسالة الغرفة

دعم قطاعات الأعمال من خلال تقديم خدمات ذات مستوى عالي لتعزيز قدراتها التنافسية وتحقيق تنمية اقتصادية ومجتمعية مستدامة وفق رؤية المملكة ٢٠٣٠

القيم المؤسسية لغرفة نجران

1- العمل الجماعي
2- الشفافية والنزاهة
3- الريادة والابتكار
4- المبادرة والتميز
5- الشراكة الفعالة

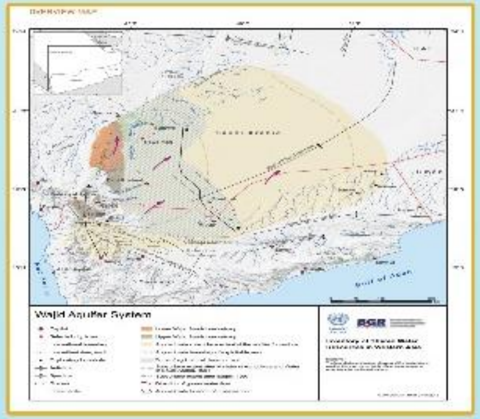
الأهداف الاستراتيجية

- تعزيز مناخ ريادة الأعمال للمساهمة في تطوير المنشآت الصغيرة والمتوسطة والقطاع الخاص لتحقيق التنمية الاقتصادية.
- المساهمة في توفير ودعم الفرص الاستثمارية في المنطقة في كافة القطاعات الاقتصادية.
- المساهمة في توطين القوى العاملة وتوليد الوظائف والمواءمة بين احتياجات منشآت القطاع الخاص وبين الكفاءات المحلية الراغبة بالعمل.
- تطوير الخدمات المقدمة من الغرفة وتطوير قنوات التعاملات الإلكترونية تلبية لحاجة المستفيدين وخدمة المجتمع.
- بناء شراكات وعلاقات تعاون قوية من خلال عمل اللجان وإقامة الفعاليات مع قطاعات الاعمال العامة والخاصة.
- تحسين وتطوير بيئة العمل الداخلي ورفع كفاءة الجهاز التنفيذي وتطوير الأنظمة الإدارية.
- البحث عن وسائل جديدة وجيدة لاستثمار ما تملكه الغرفة من أصول وتنمية مواردها المالية.

وزارة البيئة والمياه والزراعة
Ministry of Environment Water & Agriculture

فرع وزارة البيئة والمياه والزراعة بمنطقة نجران

تكوين الوجيد



تقنيات توفير المياه

تقنيات توفير المياه

أنظمة الري المتقدمة

- الري بالتنقيط: يمكن أن يساهم استخدام الري بالتنقيط في الزراعة في تقليل استهلاك المياه بشكل كبير من خلال توصيل المياه مباشرة إلى جذور النباتات، يوفر أكثر من ٥٠ من المياه المستهلكة.
- الري الذكي: تطبيق أنظمة الري الذكية التي تعدل الري بناءً على رطوبة التربة وتوقعات الطقس يمكن أن يساهم في تحسين استخدام المياه.

Technology for Water Conservation

Advanced Irrigation Systems

- Drip Irrigation: Utilizing drip irrigation in agriculture can significantly reduce water usage by delivering water directly to the plant roots, cut down water loss by 50%.

- Smart Irrigation: Implementing smart irrigation systems that adjust watering based on soil moisture and weather forecasts can optimize water use.

إعادة تدوير واستخدام المياه

حلول هندسية مبتكرة

حلول هندسية مبتكرة:

أنظمة الصرف الحضرية المستدامة (SUDs) - مدن الإسفنج

- الغرض: تهدف SUDs إلى إدارة تصريف مياه الأمطار في المناطق الحضرية، مما يقلل من خطر الفيضانات ويحسن جودة المياه.

- التطبيق في نجران: يمكن أن يساعد دمج SUDs في نجران في إدارة مياه الفيضانات المفاجئة في الأودية، مما يقلل من الضرر المحتمل ويحسن استدامة المياه ويعزز إعادة شحن المياه الجوفية.

Innovation Engineering Solutions:

Sustainable Urban Drainage Systems (SUDs) - Sponge Cities

- Purpose: SUDs aim to manage surface water runoff in urban areas, reducing the risk of flooding and enhancing water quality.

- Implementation in Najran: Incorporating SUDs in Najran can help manage flash flood waters in wadis, reducing potential damage and improving water sustainability and enhancing ground water recharge.

جمعية الآثار والتاريخ بنجران (جاتن)

جمعية الآثار والتاريخ بنجران
Najran Society for History and Archaeology

بالتعاون مع منظمة الامم المتحدة للمياه

UN- Water

تحتفي جامعة نجران باليوم العالمي للمياه
22 مارس تحت عنوان

Water for peace

وبحكم دور جمعية جاتن في أنشطة المسؤولية المجتمعية ندعوكم للمشاركة في معرض الملصقات العلمية للتحدث عن المحاور التالية :

01 لمحة تاريخية عن أهمية الموقع الجغرافي لمنطقة نجران

02 الآبار التاريخية ودورها في دعم الحضارة الانسانية الخاصة في منطقة نجران

03 آبار حمى بين الماضي والمستقبل

04 دور المجتمع المحلي في إدارة الموارد المائية

نقش (الأخدود 35) نقش تذكاري يعود تقريبا للقرن 2 م وهو يحيي ذكرى انشاء هذه المنشأة المختصة بالري وخزن المياة والتي هي عبارة عن سد وقنوات مائية وصهاريج تخزن مايقارب من ٢٤٠ م مكعبا من المياة في اسفل جبل الحمر . يتكون النقش من ثمانية اسطر

ويقول :

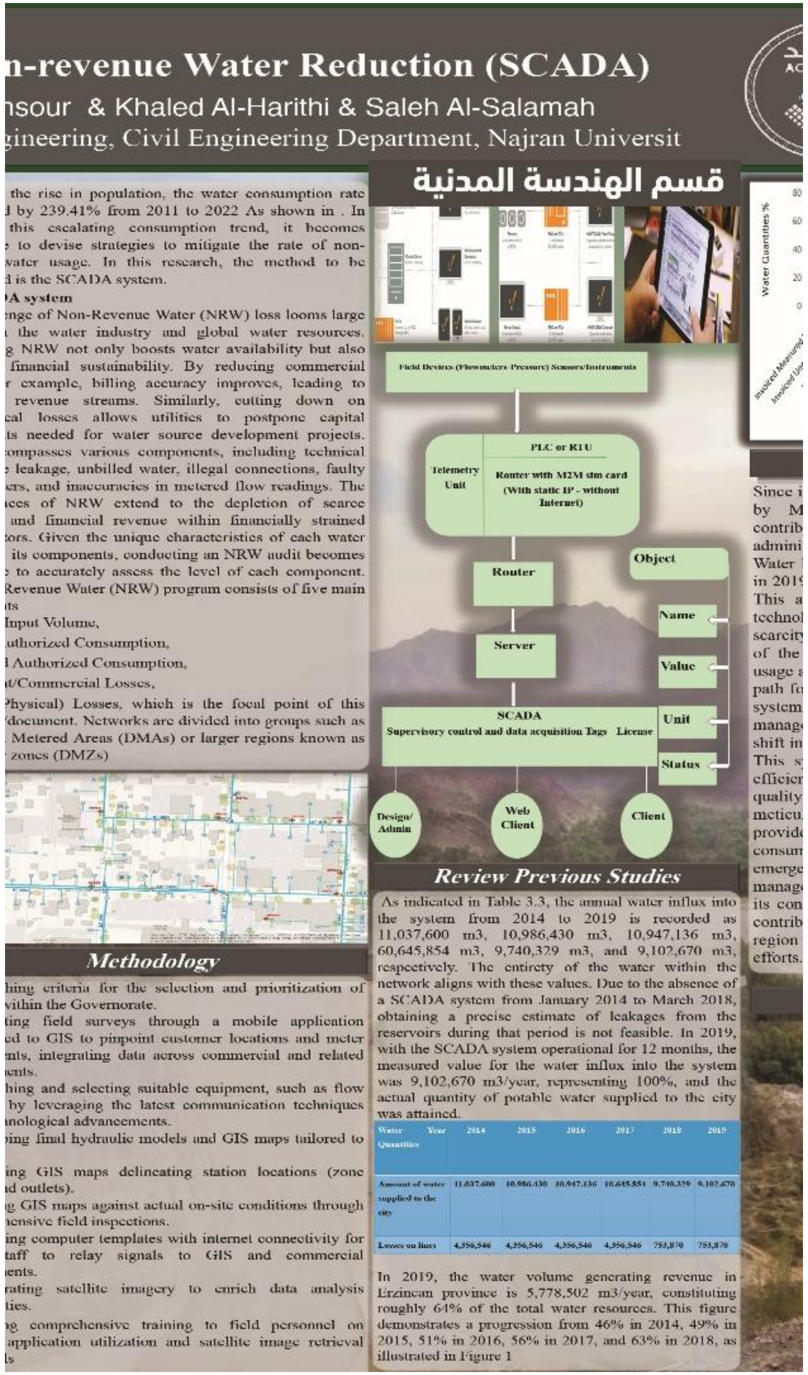
هوف عثت يحشو بن جدن الحاكم باسم ملك سبأ في نجران وشعبها وكل شعب ذو .... قد بنى صهريجهم بمساعدة الاله ذي سموي ذو كأبتن و عثتر الشارق والمقة رب معبد اوام و ذو سموي رب صخور رجمة .

Najran Tours

مشاركة طلاب كلية الهندسة

قسم الهندسة المدنية

- مشاركة طلاب قسم الهندسة المدنية بعرض خمس ملصقات علمية عن اهم وأحدث الممارسات في إدارة الموارد المائية .



n-revenue Water Reduction (SCADA)

nsour & Khaled Al-Harithi & Saleh Al-Salamah
gineering, Civil Engineering Department, Najran Universit

قسم الهندسة المدنية

the rise in population, the water consumption rate
d by 239.41% from 2011 to 2022 As shown in . In
this escalating consumption trend, it becomes
e to devise strategies to mitigate the rate of non-
water usage. In this research, the method to be
d is the SCADA system.

A system

enge of Non-Revenue Water (NRW) loss looms large
the water industry and global water resources.
g NRW not only boosts water availability but also
financial sustainability. By reducing commercial
r example, billing accuracy improves, leading to
revenue streams. Similarly, cutting down on
cal losses allows utilities to postpone capital
ts needed for water source development projects.
ompasses various components, including technical
leakage, unbilled water, illegal connections, faulty
ers, and inaccuracies in metered flow readings. The
nces of NRW extend to the depletion of scarce
and financial revenue within financially strained
tors. Given the unique characteristics of each water
its components, conducting an NRW audit becomes
to accurately assess the level of each component.
Revenue Water (NRW) program consists of five main
ts

Input Volume,
uthorized Consumption,
d Authorized Consumption,
nt/Commercial Losses,
Physical) Losses, which is the focal point of this
document. Networks are divided into groups such as
Metered Areas (DMAs) or larger regions known as
zones (DMZs)

Field Devices (Flowmeters-Pressure) Sensors/Instruments

Telemetry Unit
PLC or RTU
Router with M2M sim card (With static IP - without Internet)

Router
Server
SCADA
Supervisory control and data acquisition Tags License
Object
Name
Value
Unit
Status
Design/ Admin
Web Client
Client

Methodology

hing criteria for the selection and prioritization of
vithin the Governorate.
ting field surveys through a mobile application
ed to GIS to pinpoint customer locations and meter
nts, integrating data across commercial and related
ents.
hing and selecting suitable equipment, such as flow
by leveraging the latest communication techniques
nological advancements.
ping final hydraulic models and GIS maps tailored to

ing GIS maps delineating station locations (zone
nd outlets).
g GIS maps against actual on-site conditions through
hensive field inspections.
ing computer templates with internet connectivity for
taff to relay signals to GIS and commercial
ents.
rating satellite imagery to enrich data analysis
ties.
g comprehensive training to field personnel on
application utilization and satellite image retrieval
ls

Review Previous Studies

As indicated in Table 3.3, the annual water influx into the system from 2014 to 2019 is recorded as 11,037,600 m3, 10,986,430 m3, 10,947,136 m3, 60,645,854 m3, 9,740,329 m3, and 9,102,670 m3, respectively. The entirety of the water within the network aligns with these values. Due to the absence of a SCADA system from January 2014 to March 2018, obtaining a precise estimate of leakages from the reservoirs during that period is not feasible. In 2019, with the SCADA system operational for 12 months, the measured value for the water influx into the system was 9,102,670 m3/year, representing 100%, and the actual quantity of potable water supplied to the city was attained.

Water Quantities Year	2014	2015	2016	2017	2018	2019
Amount of water supplied to the city	11,037,600	10,986,430	10,947,136	10,645,854	9,740,329	9,102,670
Losses on lines	4,356,546	4,356,546	4,356,546	4,356,546	753,870	753,870

In 2019, the water volume generating revenue in Erzincan province is 5,778,502 m3/year, constituting roughly 64% of the total water resources. This figure demonstrates a progression from 46% in 2014, 49% in 2015, 51% in 2016, 56% in 2017, and 63% in 2018, as illustrated in Figure 1

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Smart irrigation system

Ibrahim Mohammed Alyami – Zayed Mahdi Al Dohan - Ali Mohammed Aljarallah

قسم الهندسة المدنية

معتمد ACCREDITED
جامعة نجران NAJRAN UNIVERSITY كلية الهندسة

Abstract/Intro/Motivation

Water is a great blessing from Allah, and all living beings on this Earth depend on it. Life without water is unimaginable, and that is why our religion commands us to preserve it and avoid wastefulness. In this scientific poster, we will discuss water and how to conserve it through the use of smart irrigation techniques, which contribute to water conservation. We will begin by defining the smart system and then explain how smart irrigation systems work. Next, we will discuss the components of a smart irrigation system, including the irrigation system itself and the devices used in it. Lastly, we will highlight the benefits of smart irrigation systems.

We chose this topic because of the importance of using smart irrigation systems to preserve water and ensure its sustainability for future generations. Our aim is to raise awareness about the significance of utilizing smart irrigation systems in irrigation practices.

Background

Many countries in the world are facing the problem of water shortage. Drinking water and irrigation water are very important to us. Whether farm irrigation or garden drip irrigation requires a lot of water. This process inevitably leads to water waste. Therefore, smart irrigation systems are becoming more and more important. It consists of advanced sensors and controls to minimize wasted water.

Facts have proved that compared with traditional irrigation technology, smart irrigation technology can reduce water waste by 20%-40%. It can scientifically judge whether to water plants and how much to water

What is smart irrigation?

Smart irrigation is a method of using science and technology to save water in irrigation. It contains weather sensors, soil sensors and various controllers. The sensor monitors the current weather conditions and the actual ground humidity, and the controller controls the water valve to open or close. Realize automatic irrigation. Scientific judgment on whether, when, and how much water is needed. It is suitable for water-saving management in lawns, farmland, landscape and other areas.

How do smart irrigation systems work?

Smart irrigation systems monitor weather, soil moisture, evaporation and plant species to automatically adjust watering schedules. Irrigation work can be carried out by time and area, avoiding the waste of water caused by traditional preset irrigation.

A smart water valve contains a valve controller, a flow meter, wireless connectivity, and a power source. The smart valve captures data from flow meters, which measures water flow through each of your irrigation lines. It then sends that information to a cloud managed software platform via a wireless connection. From there, you can access your water usage data on your phone or computer at any time, from anywhere and make adjustments accordingly.

Smart irrigation system component
- Soil moisture sensor
- Evaporation sensor and leaf wetness sensor
- Rain and snow sensor
- Wind speed sensor

Reference

- Renkeer_admin, Smart Irrigation Technology And System, https://www.renkeer.com/smart-irrigation-technology-and-system
- Bennett Fitzgibbon, WHAT ARE SMART IRRIGATION SYSTEMS AND HOW DO THEY WORK, https://lumo.ag/what-are-smart-irrigation-systems-and-how-do-they-work .
- Explore the Top 10 Irrigation Industry Trends in 2024 -https://www.startus-insights.com/innovators-guide/irrigation-industry-trends/
- Khaled Obaideen a, Bashria A.A. Yousef, Yong Chai Tan c An overview of smart irrigation systems using IoT - https://www.sciencedirect.com/science/article/pii/S2772427122000791

Results/Discussion

One of the main benefits of smart irrigation systems is associated with the lower water consumption. Also, most of the work related to irrigation is automated through such an approach, only the required amount of water is utilized for the irrigation process and lesser wastage takes place. In traditional ways of irrigation where most of the handling and operations were carried out manually, an ample amount of water was wasted in the irrigation process where human intervention was required. With Smart irrigation, there is no or less human involvement and the resource of water is only used to the extent to which it is required only. Further, high cost-efficiency is one of the other benefits linked to it as lesser water utilization and precision in the process allows saving costs and overall expenses [70]. Energy consumption is also reduced significantly through the approach as machines have to run for a lower amount of time and planned intervals take place during the process that lowers the utilization of overall energy. We can summarize the benefits of using a smart irrigation system in the following points:

Smart irrigation system advantages
1- Save water
2- Save manpower
3- Remote management
4- Intelligent control
5- Fine irrigation

Future Directions

Crop & Soil Sensors
Farmers tend to use Crop & Soil Sensors where provide real-time data on soil moisture levels, crop water requirements, and other environmental conditions. These sensors use advanced sensing technologies like capacitance sensors, tensiometers, or spectral analysis. This enables precise monitoring of soil moisture content, temperature, and nutrient levels. Such Internet of Things (IoT)-sourced data enables farmers to make informed irrigation decisions and implement precise schedules based on the specific needs of the crops and soil. By optimizing irrigation practices through crop and soil monitoring, farms improve irrigation efficiency and crop health while conserving resources.

Title: Exploring Atmospheric Water Harvesting in Najran Region using Metallic Inorganic Framework

Saud al-Tisan ,Mohammed Abdullah, Saleh AlMasabi

قسم الهندسة المدنية

معتمد ACCREDITED
جامعة نجران NAJRAN UNIVERSITY

Introduction

Growing concerns about fresh water scarcity due to factors like population growth, climate change, and pollution necessitate innovative solutions. Atmospheric water harvesting (AWH) emerges as a promising option, leveraging abundant moisture in the air. Passive methods like dew and fog harvesting, alongside active techniques, provide avenues for water collection. Inspired by nature, fog collectors mimic animal abilities, while dew harvesting employs both passive and energy-dependent methods. Ongoing technological advancements focus on enhancing AWH efficiency, particularly through adsorption-based techniques for sustainability (Boretti and Rosa 2019; Unicef 2020; Bilal et al. 2022; Khalil et al. 2016; Domen et al. 2014; Nørgaard and Dacke 2010; Tu et al. 2018; Schemenauer et al. 2016; Inbar et al. 2020; Wang et al. 2016; Gido et al. 2016).

Water harvesting and Arid Regions

In dry regions like Scottsdale, Arizona, where humidity can be as low as 8 percent, traditional fog harvesters aren't effective. However, a team at UC Berkeley devised a solution using sunlight and metal-organic frameworks (MOFs) to collect water. Their device, tested in Scottsdale, consists of MOFs inside a box with a transparent cover. At night, the cover is open, allowing MOFs to absorb water. During the day, sunlight heats the MOFs, releasing the water which condenses for collection. The water collected is safe to drink, as confirmed by team members.

The device is small, and collected about one-third of a cup of water per pound of MOF. MOFs, unfortunately, are very expensive, but Yaghi and his team are creating a cheaper version with aluminum instead of zirconium. He's also considering making a more active version; if you include a fan that pushes air through, it's possible that you could collect a lot more water. And next, they plan to test the device in one of the hottest, driest places in the US: California's Death Valley.

Development of MOFs

The development of Metal Organic Frameworks (MOFs) since 1989 has been a major breakthrough in materials science, allowing for the creation of structures with permanent porosity and large surface areas. Proposed by Omar Yaghi in 1995, MOFs offer versatility in applications such as gas adsorption, molecule separations, and water harvesting. The reticular synthesis approach has led to the discovery of over a hundred thousand MOF structures. Notably, MOFs like MOF-801 and MOF-841 have shown promise in extracting water from the air, even in low humidity conditions. This adaptability makes MOFs a promising technology for atmospheric water harvesting. (References: Hoskins and Robson, 1989; Yaghi et al., 2003; Kondo et al., 1997; Li et al., 1998; Zhou et al., 2020; Bilal et al., 2022; Canivet et al., 2014a; Furukawa et al., 2014; Ejeian and Wang, 2021; Kim et al., 2017; Suh et al., 2019; Xu and Yaghi, 2020).

a Graphic representation of low RH; and b water productivity of MOF-303 (Xu and Yaghi 2020)

Conclusions and Future Trends in MOFs-Based Adsorbent

MOFs offer a promising solution for Atmospheric Water Harvesting (AWH), presenting a novel method to provide clean water consistently and efficiently throughout the year. Overcoming challenges such as cost and scalability, MOFs and MOF-based devices are poised to enter the market, alleviating global water stress. To enhance AWH development, research focuses on improving water sorption capabilities of MOFs tailored to specific community needs. Further studies are essential to compare nanoporous AWH materials with traditional porous ones, addressing concerns related to air pollutants and bacterial contamination. Thorough assessment of costs, including materials, catchment devices, and maintenance, is crucial to advancing this technology. Standardized metrics, such as water production ratios or payback periods, should be established for evaluating and grading AWH systems

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Using Natural Solutions for Water Recharge in Wadi Najran

-Emad Rashad AL- Jawfi –Mister Moriya Al Salah
-Hamad Ali AL Fageer -Abdullah Saleh AL Jawad

قسم الهندسة المدنية

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جامعة نجران NAJRAN UNIVERSITY كلية الهندسة

Abstract/Intro/Motivation

Wadi Najran, situated in the southern part of the Kingdom of Saudi Arabia, has encountered a surge in earth fissures due to *groundwater depletion*. These fissures pose a significant risk to the region's stability and agricultural activities. An interdisciplinary study was conducted to understand the underlying causes and propose natural solutions for water recharge. Najran Basin, covering approximately 360,000 square kilometers, has witnessed substantial development over the past three decades. It hosts archeological sites and serves as an agricultural area within the floodplain of Wadi Najran. However, the appearance of numerous earth fissures has raised concerns. These fissures result from *groundwater over pumping*, leading to soil compaction and surface subsidence. The tension caused by excessive pumping rates contributes to the formation of these fissures.

The need for sustainable water management in Wadi Najran is urgent. To address this, we explore natural solutions for water recharge. Here are some potential approaches:1. *Recharge Ponds*: Designing and strategically locating ponds within the watershed can facilitate runoff collection, drainage, and safe disposal of excess water².2. *Najran Valley Dam*: This multipurpose dam collects runoff and sediment in the wadi, aiding in water supply, flood control, and groundwater recharge³.3. *Monitoring and GIS Techniques*: Leveraging remote sensing and GIS tools can help monitor water resources and assess recharge events. Remember, under arid desert conditions, aquifer recharge takes years. Implementing sustainable practices is crucial for preserving Wadi Najran's water resources and mitigating the impact of earth fissures..

Background

The *Najran Basin, grapples with a pressing issue: **groundwater depletion*. Over time, human activities—particularly agriculture—have led to a decline in groundwater levels. As a result, the basin faces several challenges:1. *Earth Fissures*: These fissures, resulting from subsurface stress, have emerged in Wadi Najran. They pose risks to infrastructure and the environment.2. *Subsurface Topography*: Anomalies in subsurface profiles hint at the presence of subsurface features that influence fissure formation.3. *Recharge Imbalance*: The balance between water discharge and recharge reveals a significant groundwater depletion rate in Wadi Najran.

Objectives

1. *Aquifer Replenishment*: Develop strategies to enhance groundwater recharge in Wadi Najran, ensuring sustainable aquifer levels.2. *Mitigate Earth Fissures*: Address the emergence of earth fissures by promoting effective recharge methods that reduce subsurface stress.3. *Ecological Balance*: Maintain a harmonious balance between water discharge and recharge, supporting the region's ecosystem.4. *Community Awareness*: Educate local communities about the importance of water conservation and natural recharge practices.5. *Monitoring and Adaptation*: Establish monitoring systems to track recharge progress and adapt strategies as needed.

Integrating different stormwater harvesting and infiltration management practices options

Methods

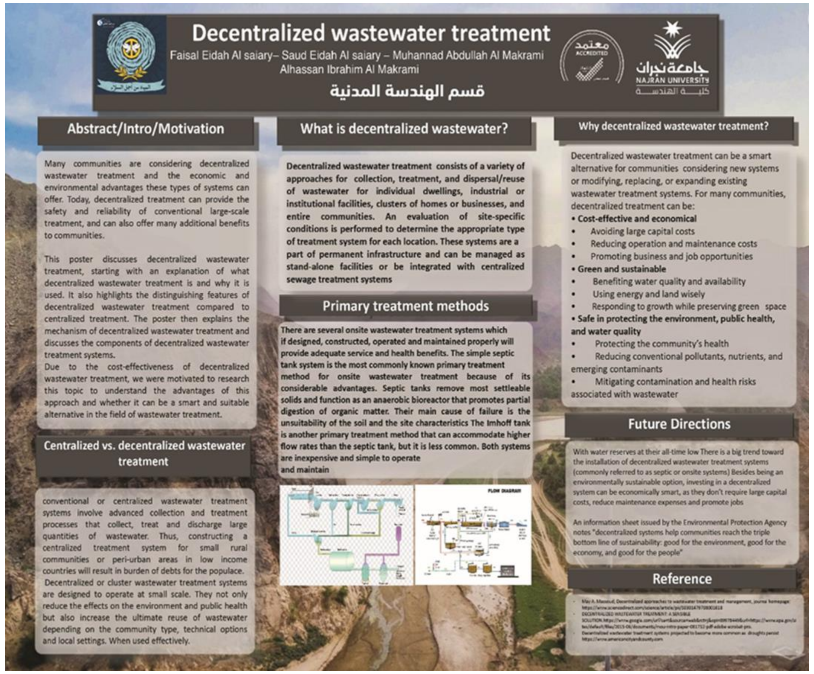
1. *Rainwater Harvesting*: Capture and store rainwater during the infrequent but intense rainfall events in Wadi Najran. Construct cisterns, check dams, and rooftop collection systems to maximize rainwater utilization.2. *Permeable Surfaces*: Promote the use of permeable pavements and surfaces. These allow rainwater to infiltrate the ground rather than running off, facilitating groundwater recharge.3. *Afforestation and Reforestation*: Plant native trees and shrubs in the watershed area. Their roots help stabilize soil, prevent erosion, and enhance infiltration.4. *Check Dams and Gabions*: Construct check dams across wadis (dry riverbeds) to slow down water flow during flash floods. Gabions (wire mesh containers filled with rocks) can also be used to control erosion and promote sediment deposition.5. *Managed Aquifer Recharge (MAR)*: Identify suitable locations for MAR by artificially recharging aquifers. Techniques include injection wells, infiltration basins, and spreading channels.6. *Terracing and Swales*: Create terraces on slopes to reduce runoff velocity. Swales (shallow depressions) capture and direct surface water, allowing it to infiltrate gradually.7. *Artificial Recharge Ponds*: Design and construct recharge ponds within the watershed. These ponds collect excess water during floods and allow it to percolate into the aquifer.8. *Education and Awareness*: Educate local communities about water conservation, sustainable practices, and the importance of preserving Wadi Najran's natural water sources.

Results/Discussion

1. *Groundwater Depletion and Earth Fissures*: - *Najran Basin, situated in the southern part of Saudi Arabia, has witnessed significant **groundwater depletion* due to agricultural activities and other groundwater uses. - The basin recently experienced the sudden appearance of numerous *earth fissures*. - An interdisciplinary study was conducted to understand the reasons behind these fissures. - *Hydrological analysis* revealed that the groundwater level is decreasing over time. - Groundwater depletion leads to *subsurface stress accumulation*, causing soil hydro-consolidation, which creates ideal conditions for earth fissure formation. - *Electrical resistivity data* indicated anomalies in subsurface profiles, likely due to subsurface topography, another key factor contributing to earth fissures¹.2. *Quantifying Groundwater Depletion*: - A simple comparison between water discharge (84.3 × 10^6^ m^3^/year) and water recharge (53 × 10^6^ m^3^/year) in *Wadi Najran* reveals that groundwater depletion amounts to approximately *31.3 × 10^6^ m^3^/year*. - Excessive pumping rates have disrupted the balance between recharge and discharge, with discharge significantly exceeding recharge¹.3. *Challenges and Solutions*: - *Sustainable management* of groundwater resources is crucial to mitigate further depletion. - Implementing *recharge techniques* such as *dams coupled with aquifer storage and recovery wells* can enhance water availability. - *Mapping groundwater potential* based on factors like slope and infiltration can guide effective recharge strategies²³.In summary, addressing groundwater depletion in Wadi Najran requires a holistic approach, combining scientific understanding, sustainable practices, and innovative solutions to ensure water security for the region. 🌍💧.

Future Directions

1. *Integrated Water Management*: - Establish an *integrated water management framework* that involves collaboration among government agencies, researchers, and local communities. - Prioritize *sustainable water use practices* to ensure long-term availability.2. *Artificial Recharge Techniques*: - Investigate and implement *artificial recharge methods*: - *Managed Aquifer Recharge (MAR)*: Construct recharge basins or infiltration galleries to replenish aquifers during rainy seasons. - *Percolation Ponds*: Create ponds to allow surface water to infiltrate into the groundwater. - *Injection Wells*: Inject treated wastewater or excess surface water directly into the aquifer. - *Check Dams*: Construct small dams along wadis to trap sediment and recharge groundwater.3. *Rainwater Harvesting*: - Promote *rainwater harvesting* at both individual and community levels. - Install *rainwater collection systems* on rooftops and public buildings. - Educate residents about the benefits of rainwater harvesting.4. *Eco-Friendly Agriculture*: - Encourage *sustainable agricultural practices*: - *Drip Irrigation*: Opt for efficient irrigation techniques to minimize water wastage. - *Crop Selection*: Promote drought-tolerant crops suitable for the region. - *Soil Moisture Monitoring*: Use sensors to optimize irrigation schedules.5. *Research and Monitoring*: - Invest in *hydrogeological research*: - *Aquifer Characterization*: Understand the hydrogeological properties of Wadi Najran's aquifers. - *Water Balance Studies*: Continuously monitor water inflows, outflows, and storage. - Implement a *real-time monitoring network* to track groundwater levels and quality.6. *Community Engagement*: - Raise awareness about water conservation and recharge methods. - Involve local communities in *water stewardship programs*. - Foster a sense of ownership and responsibility.7. *Policy and Regulation*: - Develop and enforce *water management policies*: - *Water Allocation*: Allocate water resources fairly and sustainably. - *Licensing and Permits*: Regulate groundwater extraction. - *Incentives*: Provide incentives for adopting recharge practices.



Decentralized wastewater treatment

Faisal Eidah Al saiary– Saud Eidah Al saiary – Muhannad Abdullah Al Makrami
Alhassan Ibrahim Al Makrami

قسم الهندسة المدنية

معتمد ACCREDITED
جامعة نجران NAJRAN UNIVERSITY كلية الهندسة

Abstract/Intro/Motivation

Many communities are considering decentralized wastewater treatment and the economic and environmental advantages these types of systems can offer. Today, decentralized treatment can provide the safety and reliability of conventional large-scale treatment, and can also offer many additional benefits to communities.

This poster discusses decentralized wastewater treatment, starting with an explanation of what decentralized wastewater treatment is and why it is used. It also highlights the distinguishing features of decentralized wastewater treatment compared to centralized treatment. The poster then explains the mechanism of decentralized wastewater treatment and discusses the components of decentralized wastewater treatment systems.

Due to the cost-effectiveness of decentralized wastewater treatment, we were motivated to research this topic to understand the advantages of this approach and whether it can be a smart and suitable alternative in the field of wastewater treatment.

Centralized vs. decentralized wastewater treatment

conventional or centralized wastewater treatment systems involve advanced collection and treatment processes that collect, treat and discharge large quantities of wastewater. Thus, constructing a centralized treatment system for small rural communities or peri-urban areas in low income countries will result in burden of debts for the populace.

Decentralized or cluster wastewater treatment systems are designed to operate at small scale. They not only reduce the effects on the environment and public health but also increase the ultimate reuse of wastewater depending on the community type, technical options and local settings. When used effectively.

What is decentralized wastewater?

Decentralized wastewater treatment consists of a variety of approaches for collection, treatment, and dispersal/reuse of wastewater for individual dwellings, industrial or institutional facilities, clusters of homes or businesses, and entire communities. An evaluation of site-specific conditions is performed to determine the appropriate type of treatment system for each location. These systems are a part of permanent infrastructure and can be managed as stand-alone facilities or be integrated with centralized sewage treatment systems

Primary treatment methods

There are several onsite wastewater treatment systems which if designed, constructed, operated and maintained properly will provide adequate service and health benefits. The simple septic tank system is the most commonly known primary treatment method for onsite wastewater treatment because of its considerable advantages. Septic tanks remove most settleable solids and function as an anaerobic bioreactor that promotes partial digestion of organic matter. Their main cause of failure is the unsuitability of the soil and the site characteristics The Imhoff tank is another primary treatment method that can accommodate higher flow rates than the septic tank, but it is less common. Both systems are inexpensive and simple to operate and maintain

Why decentralized wastewater treatment?

Decentralized wastewater treatment can be a smart alternative for communities considering new systems or modifying, replacing, or expanding existing wastewater treatment systems. For many communities, decentralized treatment can be:

- **Cost-effective and economical**
  - Avoiding large capital costs
  - Reducing operation and maintenance costs
  - Promoting business and job opportunities
- **Green and sustainable**
  - Benefiting water quality and availability
  - Using energy and land wisely
  - Responding to growth while preserving green space
- **Safe in protecting the environment, public health, and water quality**
  - Protecting the community's health
  - Reducing conventional pollutants, nutrients, and emerging contaminants
  - Mitigating contamination and health risks associated with wastewater

Future Directions

With water reserves at their all-time low There is a big trend toward the installation of decentralized wastewater treatment systems (commonly referred to as septic or onsite systems) Besides being an environmentally sustainable option, investing in a decentralized system can be economically smart, as they don't require large capital costs, reduce maintenance expenses and promote jobs

An information sheet issued by the Environmental Protection Agency notes "decentralized systems help communities reach the triple bottom line of sustainability: good for the environment, good for the economy, and good for the people"

Reference

جامعة نجران
NAJRAN UNIVERSITY

اليوم العالمي للمياه 22 مارس 2024م

UN WATER
22 MARCH
WORLD WATER DAY

المتحدث

د. صالح بن هامل

أستاذ مشارك - هندسة البيئة

المتحدث

د. عبد النور غانم

أستاذ مشارك - هندسة المياه

المتحدث

د. فواز الزعبري

أستاذ مساعد - هندسة المياه

المحاور

- المياه والطبيعة.
- دور المياه في الصناعة والنمو الاقتصادي.
- المخاطر البيئية من تلوث المياه.

- الوضع المائي الحالي في حوض وادي نجران.
- تحليل أسباب مشكلة المياه في حوض وادي نجران.
- الحلول المتكاملة والمستدامة لإدارة المياه في حوض وادي نجران.

- التغير المناخي وإدارة السيول.
- حلول غير لمواجهة السيول والاستفادة منها.
- معايير تصميم التقليدية للسدود النافذة واهميتها.

يوم الجمعة
22 مارس 2024 م

الساعة
10:00 مساءً

منتزه الأمير جلوي
(ابا رشاش)

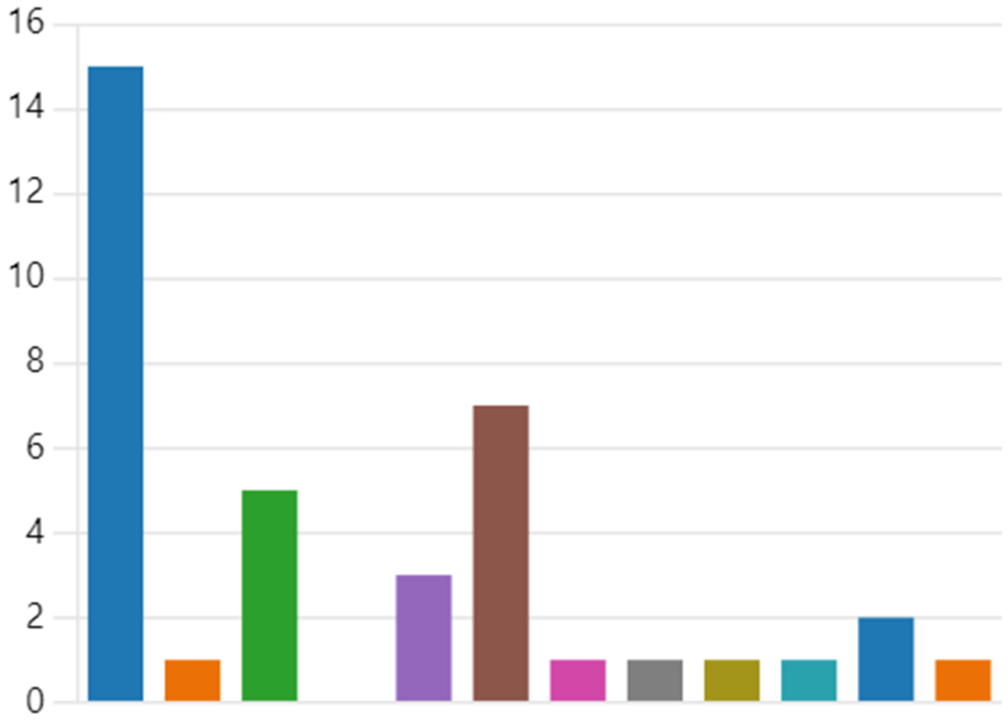
الاتصال المؤسسي
والإثراء المعرفي

najran_univers
www.nu.edu.sa

تقييم الأثر والتغذية الراجعة

المشاركين في تقييم الأثر

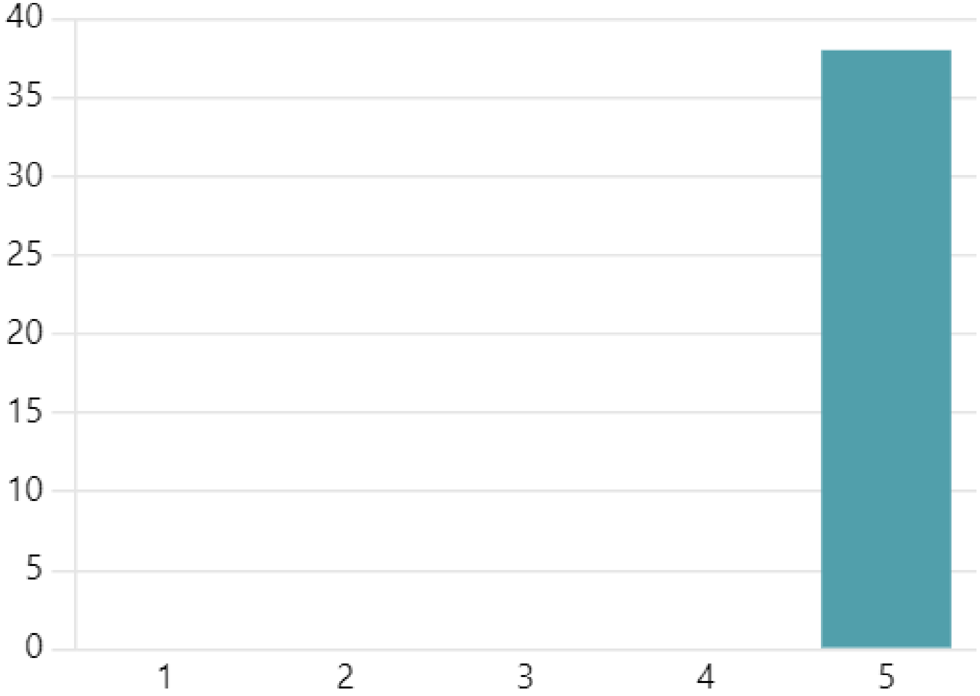
15	جامعة نجران	●
1	أمانة منطقة نجران	●
5	فرع وزارة البيئة والمياه والزراعة	●
0	شركة المياه الوطنية	●
3	الغرفة التجارية	●
7	جمعية جاتن	●
1	جمعية رعاية	●
1	جمعية نجران الخضراء	●
1	شركة مياه نجران الصحية	●
1	شركة نبع نجران	●
2	طالب بجامعة نجران	●
1	شركة نقي	●



تقييم فكرة الاحتفاء باليوم العالمي للمياه

5.00

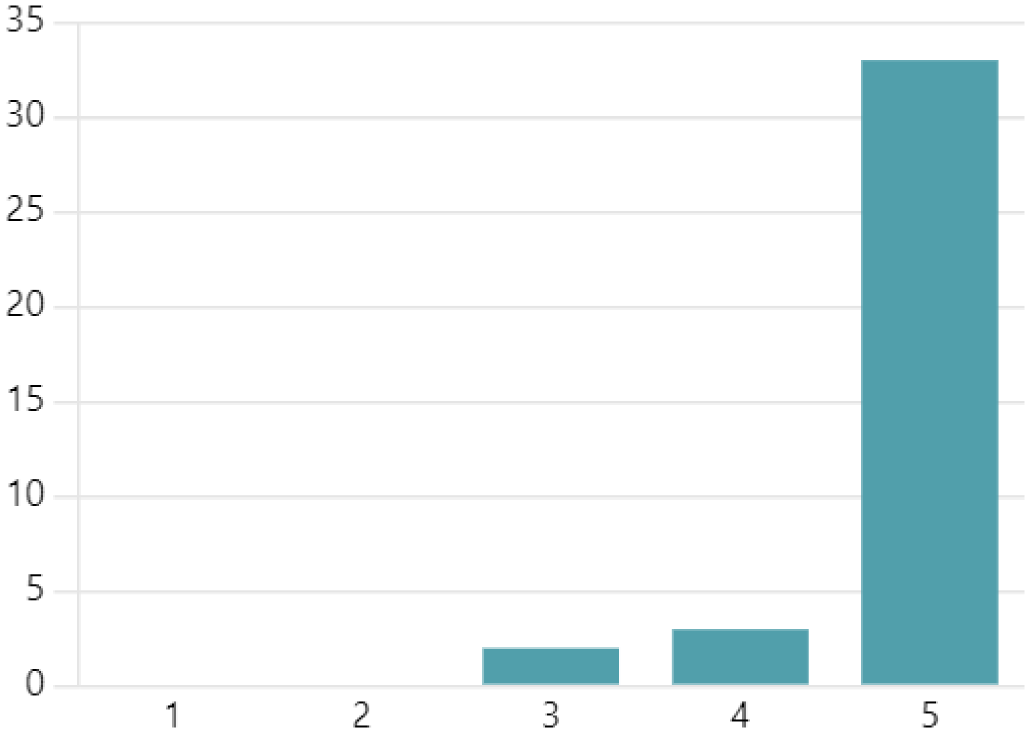
Average Rating



تقييم المعرض والملصقات العلمية

4.82

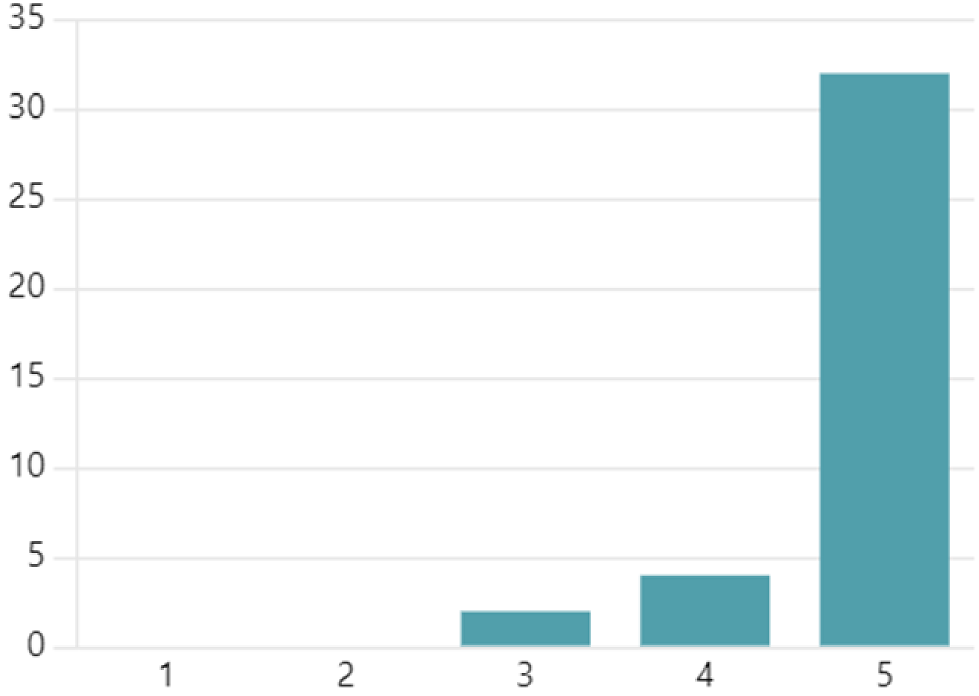
Average Rating



تقييم محتويات العرض التقديمي

4.79

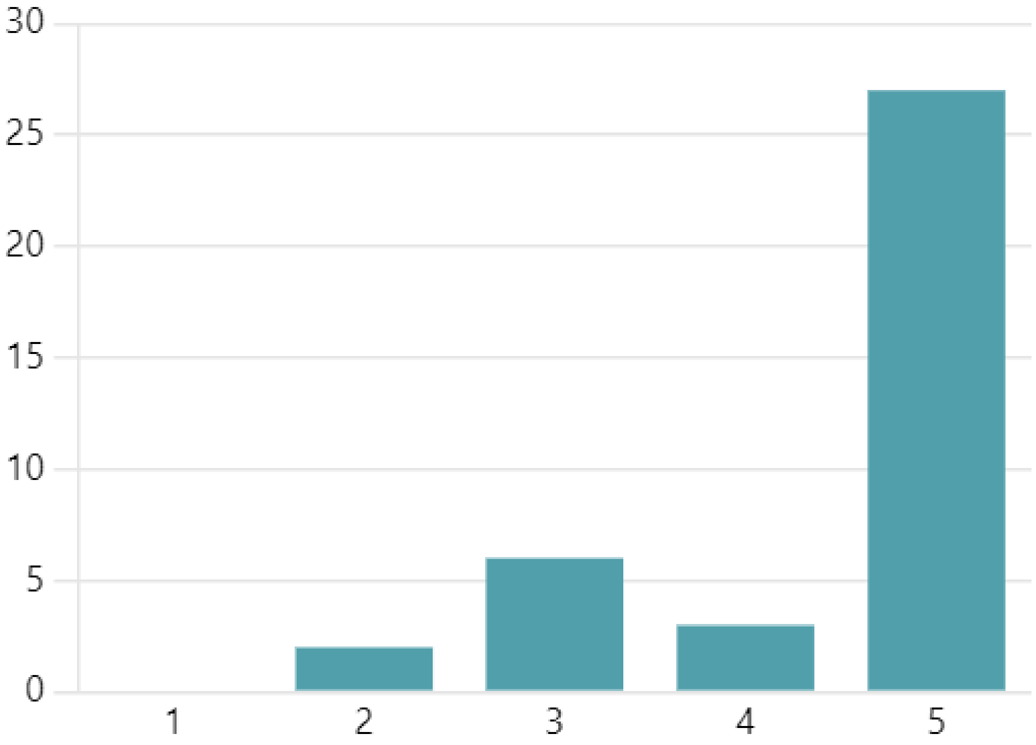
Average Rating



تقييم مكان الاحتفال باليوم العالمي للمياه

4.45

Average Rating



التوصيات والتغذية الراجعة من المستفيدين

احضار مختبر متنقل للمياه وألعاب لها علاقة بالمياه للأطفال

كان من الافضل عمل خطة اعلامية اعلانيه تسبق الفعالية بفتره حتى يتسنى لناس الحضور و التعرف على الفعالية

يتم وضع الفعاليه بمكان حيوي لكي يتم التوعيه بشكل مباشر للجمهور المستهلك الاساسي لمخزون المياه ايضا يكون هنالك بروز اعلامي مكثف وبوثات اكبر حجماً مما تم تصميمه هناك اماكن مناسبه اكثر وبها زوار اكثر مثل منتزه الملك فهد (غابة سقام سابقاً) ايضا يتم تقديم الوقت واختصاره بالهدف الرئيسي من القاء

توعية المستهلكين اكثر بأهمية المحافظة على المياة ومدى تأثيرها على المجتمع والبيئة حيث انها تلعب دور كبير جداً على هذا الاساس

الاستمرار في الاحتفال باليوم العالمي للمياه في كل عام التنسيق مبكراً والتعاون مع جهات اكثر ذات علاقة والاهم ايجاد طريقة مناسبة لتوعية طلاب المدارس والمواطنين من خلال حدث مهم كهذا

إقامة الفعاليات بالقرب من الخدمات الأساسية كدورات المياه

إشراك المنظمات الدولية بالفعالية وتعزيز دور الفعالية في التاثير على المجتمع من خلال الملصقات التوعية التي ينبغي أن تصل إلى أكبر شريحة ممكنة من المجتمع

التنسيق مبكراً والتعاون مع جهات اكثر ذات علاقة والاهم ايجاد طريقة مناسبة لتوعية طلاب المدارس والمواطنين من خلال حدث مهم كهذا

اختصار المادة العلمية المقدمة من المحاضرين


جامعة نجران
NAJRAN UNIVERSITY
معرض اليوم العالمي للمياه 2024
تحت رعاية رئيس جامعة نجران
أ.د. عبدالرحمن بن إبراهيم الحصيني

جامعة نجران

NAJRAN UNIVERSITY

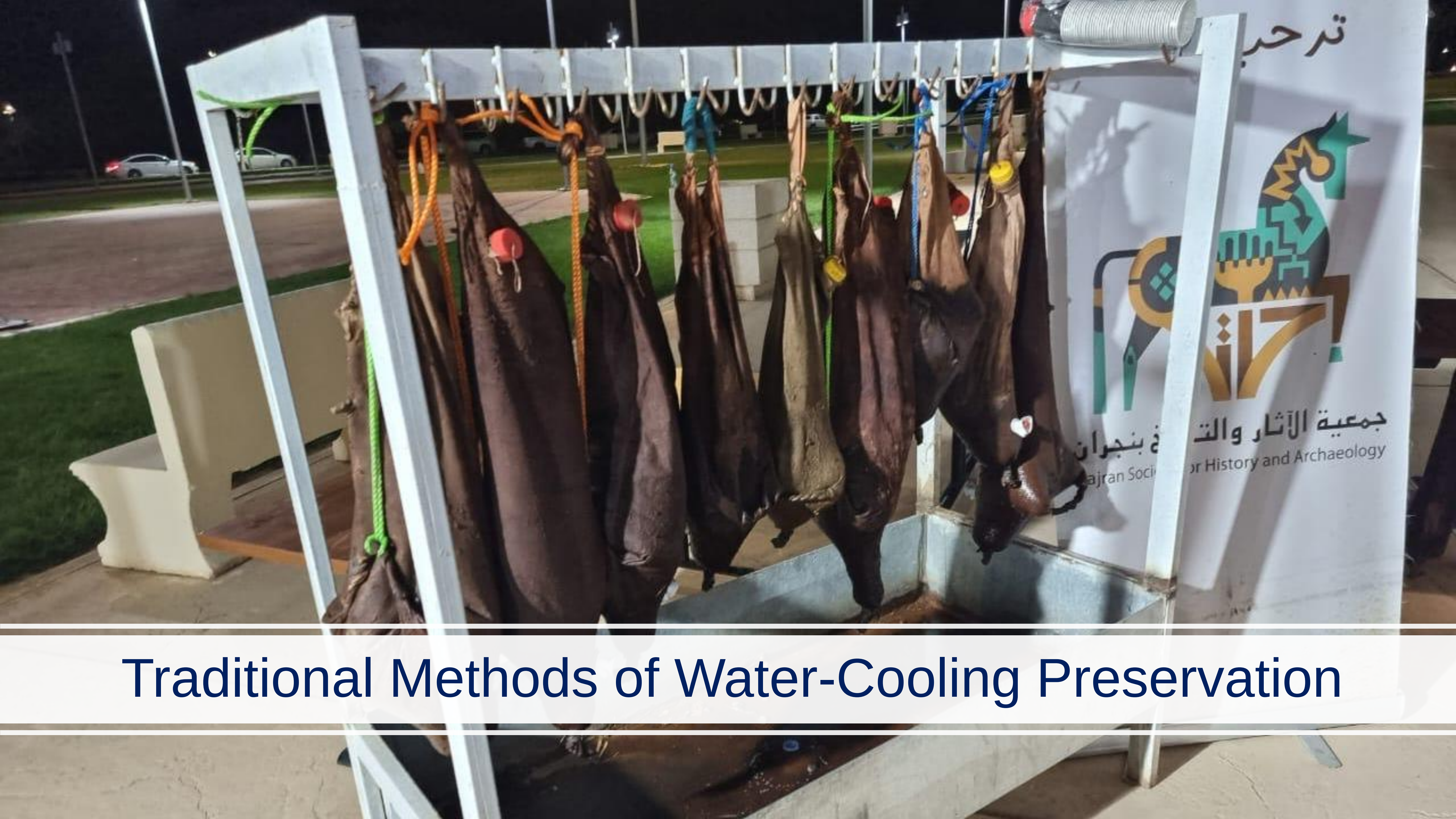
كلية الهندسة


فرع وزارة البيئة والمياه والزراعة بمنط
وزارة البيئة والمياه والزراعة
Ministry of Environment Water & Agriculture
تقنيات توفير المياه
تكوين الوجيد
إعادة تدوير واستخدام المياه
حلول هندسية مبتكرة


معرض اليوم العالمي للمياه 2024
أ.د. عبدالرحمن بن ابراهيم الحضيري

Free water bottles offered by engineering students to the community

٢٢ مارس ٢٠٢٤ ٥:٣٩ م



Traditional Methods of Water-Cooling Preservation

- تكريم احدى عشر جهه بدرع اليوم العالمي للمياه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تحت رعاية رئيس جامعة نجران

Coverage By The Saudi News Channel.

Najran University
College of Engineering

عدد المتطوعين 50
عدد الجهات المشاركة 11 جهة
عدد المستفيدين 130
تكلفة الفعالية 33550 ريال

تاريخ الفعالية 22 مارس 2024
في منتزة الأمير جلوي (أبالرشاش)

الدعم من جهة الأمم المتحدة للمياه
UN-Water
بشهادات شكر.

الدعم من شركة مياه نجران الصحية
بتبرع 50 كرتون ماء
الدعم من شركة نبع نجران بتبرع 50
كرتون ماء