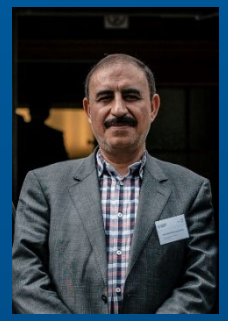
TU Dresden - Shiraz University

The path of our Strategic Partnership



Coordinator at Shiraz University
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Coordinator at TU Dresden
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TECHNISCHE UNIVERSITÄT DRESDEN

معرفی دانشگاه فنی درسدن

فرصت همکاری با ایران

TECHNISCHE UNIVERSITÄT DRESDEN

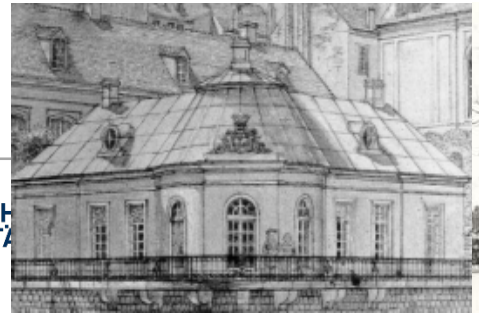
TECHNISCHE UNIVERSITÄT DRESDEN

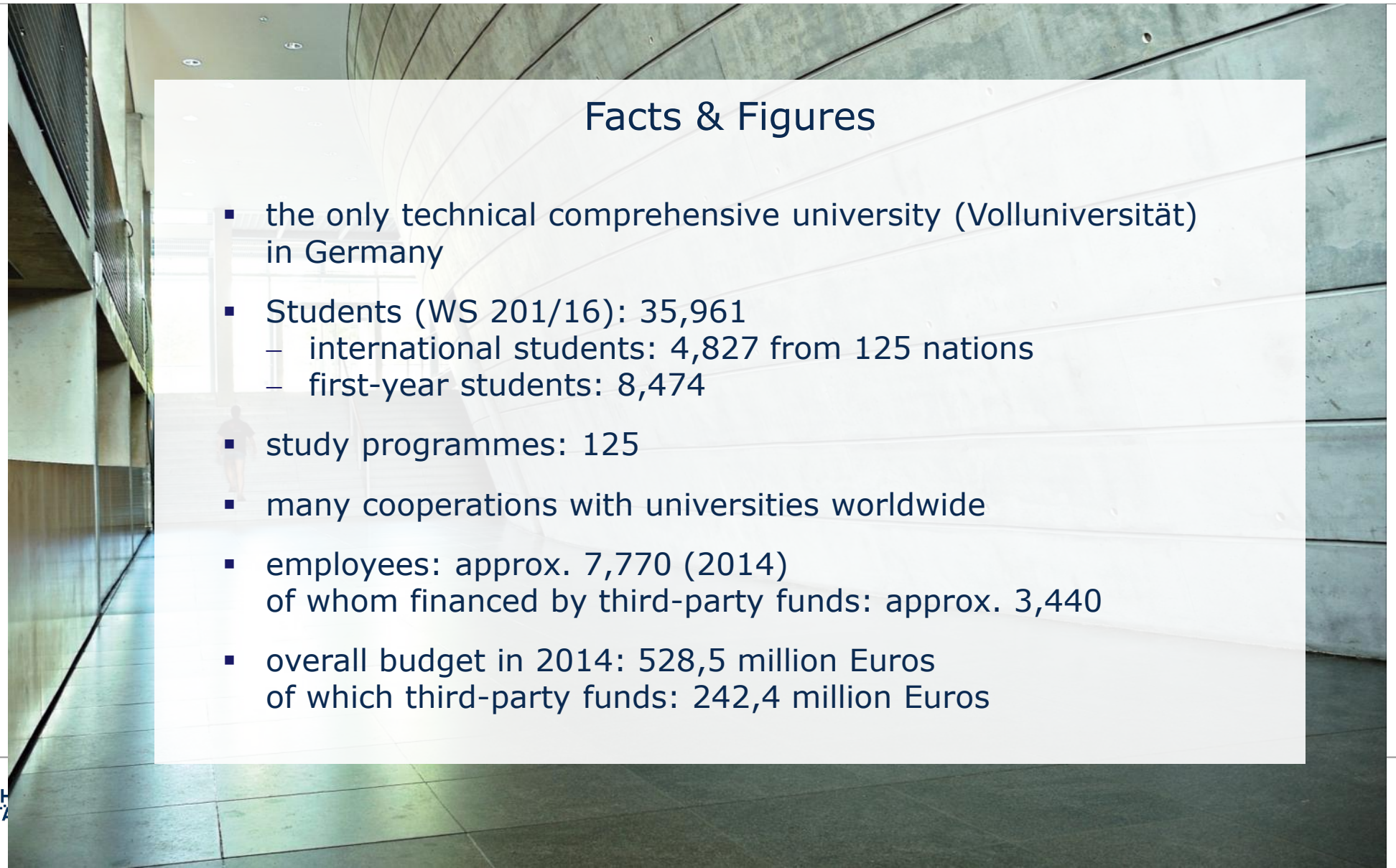
DRESDEN concept

TU Dresden: University of Excellence

187 Years of History

1828	founded as a technical school
1890	renamed “Royal Saxon Technical College“ (TH)
1945	largely destroyed during World War 2
1946	reopening of TH Dresden
1961	status of a University of Technology (TU)
1990	new faculties, comprehensive range of disciplines
2012	University of Excellence



Facts & Figures

- the only technical comprehensive university (Volluniversität) in Germany
- Students (WS 201/16): 35,961
  - international students: 4,827 from 125 nations
  - first-year students: 8,474
- study programmes: 125
- many cooperations with universities worldwide
- employees: approx. 7,770 (2014)
  of whom financed by third-party funds: approx. 3,440
- overall budget in 2014: 528,5 million Euros
  of which third-party funds: 242,4 million Euros

Five Schools – 14 Faculties

School of Civil and Environmental Engineering

- Architecture
- Civil Engineering
- Environmental Sciences
- Transportation and Traffic Science

School of Medicine

School of Science

- Faculty of Science comprising the departments Biology Chemistry and Food Chemistry, Mathematics, Physics and Psychology

School of Engineering Sciences

- Faculty of Electrical and Computer Engineering
- Faculty of Computer Science
- Faculty of Mechanical Engineering

School of Humanities and Social Sciences

- Education
- Faculty of Law
- Arts, Humanities and Social Sciences
- Linguistics, Literature and Cultural Studies
- Business and Economics

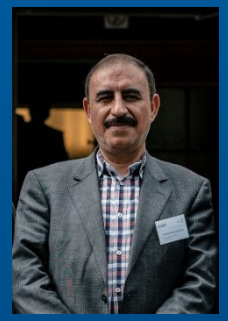
Five Research Priority Areas

1. Health Sciences, Biomedicine and Bioengineering
2. Information Technologies and Microelectronics
3. Smart Materials and Structures
4. Culture and Knowledge
5. Energy and Environment

TECHNISCHE UNIVERSITÄT DRESDEN

TU Dresden - Shiraz University

The path of our Strategic Partnership



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Focus of our Strategic Partnership

- Recognize collective research potential
- Enable scientific exchange through matching researchers of both universities to joint research projects
- Cultivate long-term research cooperations and networks
- Stimulate alliances

The path of our Strategic Partnership

Milestone I
Rector's Visit to Iran, 2016

Milestone II
Establishing of an Office at TU Dresden, April 2017

Bridging Science

Iran Week at the TU Dresden, 10 – 14 July 2017

Welcome at the TU Dresden! Dresden - A City of Culture and Science

به دانشگاه صنعتی درسدن خوش آمدید

درسدن- شهر فرهنگ و دانش

Milestone III
Iran Week in Dresden, July 2017

Financially supported by DFG

The Iran –week at TU Dresden 2017

Milestone III
Dresden Week in Shiraz, April 2018

Financially supported by DAAD

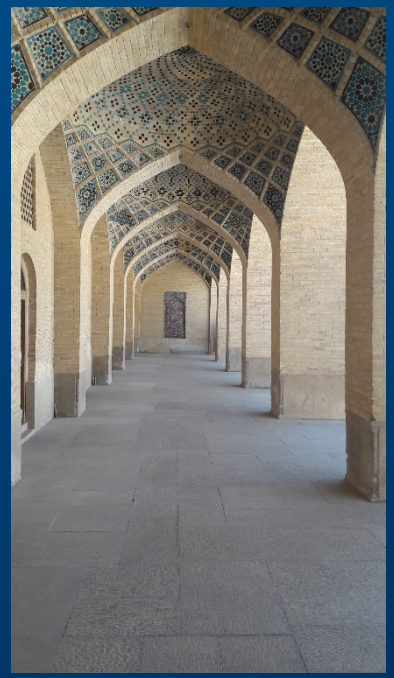
- Rector of TU Dresden
- Lord Mayor of Dresden
- Saxony Economy Development Organisation

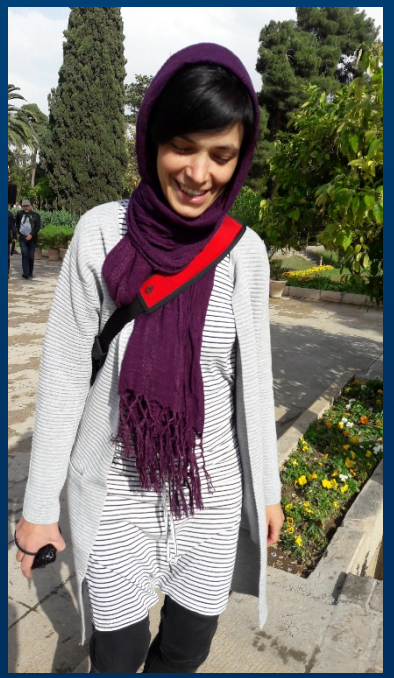
Dresden Week in Shiraz, April 2018

Office for strategic partnership at Shiraz University opened

Strategy :

- ✓ High standard scientific projects
- ✓ Sustainable cooperation by establishing a base of innovation
  - Transfer of scientific results, technologies , knowledge
  - Transfer of local requirements/ needs from Industry and Society to Science





Fact Finding Mission 05/2016, Project Scouts

1st Delegation 09/2916 of TUD, Prof.es from the field of „Energy“, Visit of 5 Universities

Iran week 07/2017

2nd Delegation 09/2017, field Wood technology, Plant Chemistry

04/ 2018 Rector´s and lord mayor´s delegation, Dresden week @SU, focus: Botany, Watermanagement, Digital Humanities

05/ 2018 Follow Up, Watermanagement, Eram Garden project and industry cooperation

10/2018 Project on Oil spill and Sand dust – workshop in Iran

12/2018 Progress visit on Digital Humanities, Eram Garden, elearning

Accomplishments

2 Joint Grant Applications at
the German Research Foundation

5 Joint Grant Applications at
the Federal Ministry of Education and Research
(CLIENT II & IKARIM)

1 Joint Project submission “Dialogue with the Islamic world”

Bilateral Exchange of students and graduates

3 Sabaticals of SU Prof.es @ TUD

- Joint master program in Biodiversity

TECHNISCHE UNIVERSITÄT DRESDEN

Fouling Mitigation Using Functionalized Surfaces Inside of Heat Exchanger Tubes

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Motivation

During the operation of heat exchangers, the deposition of mineral and biological material is a common problem. This process of deposition is called fouling. The deposits cause an additional thermal resistance, decreasing the overall heat transmittance which reduces the efficiency of the heat exchanger. Fig. 1 shows a characteristic development of the fouling resistance over time on a conventional heat exchanger surface.

By functionalizing the heat exchanger surface, it is possible to mitigate the fouling and to increase the time until the first change of the fouling resistance (induction time t_{ind}) significantly.

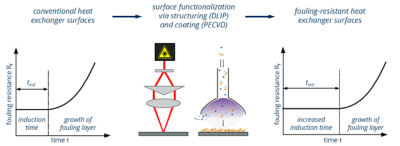

Figure 1: using functionalized surfaces to increase the induction time of the fouling process

Functionalized Surfaces With Special Wettability

Surface functionalization is applied to create surfaces with special wettability. In the current project, surfaces are functionalized with thin film coating via plasma enhanced chemical vapor deposition (PECVD) and structured via direct laser interference patterning (DLIP). The wettability of the surfaces is characterized using contact angle measurements (asymmetric drop shape analysis). Fig. 2 shows the results of contact angle measurements on some functionalized surfaces.

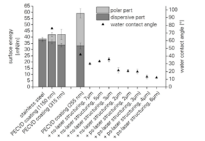

Figure 2: surface energy and water contact angle on PECVD coated and DLIP structured stainless steel surfaces

Measurement of Fouling Resistance and Induction Time of Crystallization Fouling

Fig. 3 shows a scheme of the measurement cell holding a sample.

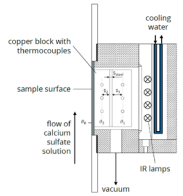

Figure 3: measurement cell for heating the sample and measuring temperatures and the heat flux

To measure the induction time of crystallization fouling on the functionalized surfaces, the functionalized samples are first soldered onto a copper block and than mounted in the measurement cell. The measurement cell heats the sample with IR lamps while the copper block holds thermocouples to determine the one directional heat flux through the sample. The measurement cell is than mounted on a test rig, where the sample surface is subjected to a controlled flow of a supersaturated calcium sulfate solution.
The heat flux q and the surface temperature ϑ_0 can be calculated as follows:

$$\dot{q} = k_1 \cdot (\vartheta_1 - \vartheta_2)$$

$$k_1 = \left(\frac{s_1 + s_2}{\lambda_{Cu}} + \frac{s_{steel}}{\lambda_{steel}}\right)^{-1}$$

$$\vartheta_0 = \vartheta_2 - \dot{q} \cdot k_2$$

To calculate the surface temperature ϑ_0, the overall heat transfer coefficient k_2 is first obtained by a modified Wilson plot method for each sample.

Cooperation with Shiraz University:
The strategic partnership between Shiraz University and TU Dresden is coordinated by Professor M. Reza Molayeri.
Visiting scientists from Shiraz University:
– Mr. Seyedamon Mousavian, December 2017 – February 2018: modelling of the fouling layer growth
– Ms. Mohshid Nategh, April 2018 – October 2018: experimental investigation of crystallization fouling on stainless steel surfaces and functionalized surfaces

TECHNISCHE UNIVERSITÄT DRESDEN

Integrated Energy Efficient Sewage Sludge Utilization – Case Study Shiraz Region and Teheran Region Acronym: EE-Sludge

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Project description

In the R&D project "EE-Sludge", a sustainable and efficient energy system for the thermal sewage sludge utilization in Iran will be developed. The project is an international cooperation between German industrial and academic experts and plant operators and universities in Iran (Shahid Behesti University, Teheran; University Shiraz) as well as Iranian industrial partners (MOJAN Engineering, Fars Regional Electric Co.). In this project, the technical, ecological, socio-economic and political/ institutional situation is analyzed in detail. Based on this investigation, a feasible concept for energy-efficient, economic, environmental friendly and system-compatible sludge utilization is developed using thermal sludge utilization technologies for the provision of electric and thermal energy. The project is focused on a maximized energy-efficient utilization of sludge as a combustible and with it a load removal from regional power grids. Additionally, applying the technology developed in the project will result in the purification of natural water courses and soils used for agriculture in Iran.

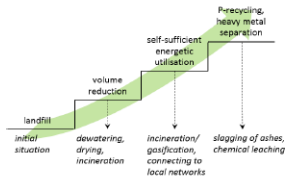


Figure 1: Scheme of the planned development path

German coordinating entity:	TU Dresden, Chair of Energy Process Engineering
Project partners in Germany:	2 Universities, 9 Enterprises
Project partners in Iran:	2 Universities, 2 Enterprises
Project duration:	36 months

Objectives

- Substantial improvement of residual management in the field of sewage sludge utilization
- Secure regional power supply facing the increasing energy demand in Iran
- Exemplary regions of Shiraz and Teheran with analyzation of the different regional conditions with regards to plant technology and sludge treatment as well as the different quantities and qualities of other residual material flows and renewable energy sources
- Identification of potentials and obstacles for a system-integrated sludge utilization concept

Expected impact

The main technological aspect of this project focuses the introduction and adjustment of thermal sewage sludge utilization concepts that are currently under development in Germany for different situations in Iran. The application of a key technology will lead to increased technological potential of the target region.

Socio-economic aspects like population growth, urbanization and political goals for connecting 60% of the urban population (42.4 % in 2016) and 30% of the rural population to WWTPs by 2025 call for technological enhancements in sewage sludge disposal and utilization. This will support sustainable population growth and provide a basis for solid economic development not only in urban but also rural areas.

There is a direct link between socio-economic and ecological effects. This includes the reduction of environmental impacts, intelligent utilization of sludge as a resource, prevention of air, water and soil pollution as well as recovery of plant nutrients contained in the sludge. Currently, untreated sludge is used in agriculture leading to contaminant accumulation in the soil. This issue intensifies with a growing population. Clean sludge utilization in energy-efficient systems and with it the protection of agricultural land need to come to the fore. Climate protection aspects are also considered in this R&D project as the open disposal of untreated sludge and its digestion lead to considerable methane emissions.

Similar problems with regards to sewage sludge utilization, the protection of natural water courses and agricultural land are well known in the entire Middle East and in the Maghreb states. In these countries, like in Iran, water resources need to be protected from overuse while at the same time water supply for a growing population has to be ensured. It is therefore assumed that the project will have a great impact beyond the target region.

DRESDEN concept

BMBF - CLIENT II
International Partnerships for Sustainable Innovations

Bundesministerium für Bildung und Forschung

FONA Research for Sustainable Development BMBF

TECHNISCHE UNIVERSITÄT DRESDEN

University of TEHRAN

Biocompatible sand fixation and sustainable fast recultivation to suppress sandstorms in Iran

(Submitted as joint proposal: IKARIM-BMBF/ Akronym: SABSI)

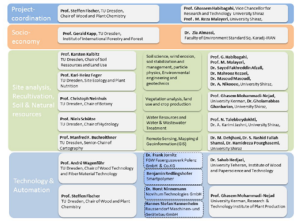
Project coordination:
Prof. Steffen Fischer, TU Dresden, Institute of Wood and Plant Chemistry
Prof. Ghassem Habibagahi, Shiraz University, Vice Rector of Research and Technology

The Risk

Large-scale sand and dust storms (SDS), resulting from the combination of strong winds and open, dry sands in arid and semi-arid areas, pose a major threat to human health, agriculture, infrastructure and transportation.

Influx of sandstorms into residential areas (Foto: Dr. Ghasem Mohammadi-Nejad, DG, ITRPP-SSLRI)

The Partners



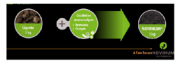
The Aim

The aim is to combine three established technological solutions in a synergetic, regionaly adapted strategy (technology triage) to sustainable fix sand erosion fields: All project parts are rooted within the local socio-economic and ethical framework.

(1) Biodegradable sand fixation

A biodegradeable cellulose based sand fixing polymer has been developed. For local production regional available cellulose resources will be tested for highest functionality and sustainability.

(2) Soil structure improvement



Hydrogel water retention and artificial humus will be used as structural soil improvement (from natural local resources - lignin or lignite) to facilitate recultivation. Both methods must be validated under the extreme climate conditions.

(3) Sustainable greening

The water box (COCOON) designed to support a seedling through its critical first year provides necessary water and shelter. This technology will be adapted to local conditions utilizing local resources for production.

Member of :
DRESDEN concept

Contact:
Udo.Krause@tu-dresden.de

BMBF - IKARIM
International disaster and risk management:
Research for civil security

Bundesministerium für Bildung und Forschung

Joint Project: Eram Botanical Garden: open science – open source – open dialogue

DAAD Deutscher Akademischer Austauschdienst
German Academic Exchange Service

Projektbeschreibung (Kurzversion)

Bitte beschreiben Sie kurz Ihr Projektvorhaben und gehen dabei auf die geplanten Programmziele ein.
Fügen Sie diese Projektbeschreibung Ihrem Antrag auf Projektförderung bei.
(Anlagen – Dokumente hinzufügen – Anlagenart „Projektbeschreibung“)

Förderprogramm	Hochschuldialog mit der islamischen Welt
Antragstellende Institution	TU Dresden, Institut für Botanik, Botanischer Garten
Projektbezeichnung	Eram Botanical Garden: open science - open source - open dialogue

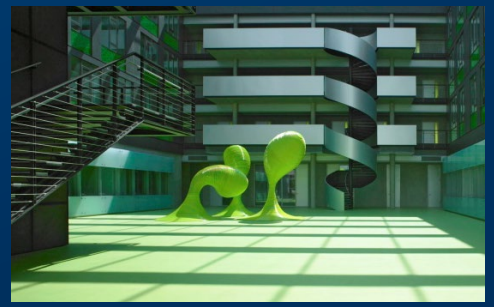
Eram Botanical Garden (EBG) in Shiraz, Iran, is one of nine historical gardens that jointly were recognized as UNESCO world heritage site representing the traditional Persian Garden in 2011

Support of strategic partnership by TU Dresden I

- ✓ all activities are channeled and fostered by the respective person for SU-TUD partnership (one entry point at each university)

- ✓ Special budget for exchange of scientists from TU Dresden

  - from SU tu TUD:
    - ❖ accomodation costs (100 €/ day)
    - ❖ subsistence
    - ❖ material costs (1000 € max.)
  - from TUD to SU
    - ❖ travel expenses + daily lump sum



Support of TUD- SU strategic partnership II

Sabbatical leave & longterm stay

Our Welcome Center staff will be glad to assist incoming visiting researchers and PhD students staying for **more than three months**

The Welcome Center informs and assists you in planning your visit to Dresden, both in advance and during your stay. These services are included:

- Formalities
- Accomodation
- Service for your Family
- German language Courses
- Social Activities

Support of TUD-SU strategic partnership III

Guest Researcher Programmes

- ✓ DRESDEN Fellowship Programme
  - ✓ Research stays of up to six months at TU Dresden for **young researchers** (DRESDEN Junior Fellowships) and **established researchers** (DRESDEN Senior Fellowships)

Challenges

- Visa for long term (Sabatical), 6 months, high uncertainty, difficult to organize accomodation
- family visa very challenging
- additional administrativ load for hosting Prof.es: Federal Intelligence Service protocols
- Dual use
- current economic situation: money /payment in Iran

Welcome at the TU Dresden!
Dresden - A City of Culture and Science

به دانشگاه صنعتی درسدن خوش آمدید

درسدن- شهر فرهنگ و دانش