MASTER OF SCIENCE IN

TUM Asia

Sustainable Food



Technische Universität München

Pioneering a New Generation of Food Champions



Focusing on food safety, food science and food technology, the MSc in Sustainable Food is designed with a holistic approach to equip individuals with specialised scientific knowledge and skill sets in food science and food safety to institute systemic change across the major pillars of today's global food system to achieve food sustainability.

The programme aims to nurture future leaders in agri-food industry to establish a new generation of sustainable and safe food by developing strategies at the policy level to integrate the highly fragmented and intricately complex food system. Students will be empowered to be critical thinkers and problem solvers to start conversations, build bridges and establish new ethical standards in instituting effective structural changes to our current food system while paving the way for a new generation of sustainable food to fulfil the global nutritional needs.

Food Safety

The course is the only postgraduate programme offered in Singapore focusing on Food Safety that deep dives into a diverse range of scientific topics such as Food Toxicology, Microbial Food Safety, Nutrition and Microbiome in Health and Disease, Energy Metabolism and Regulation, and Microbial Food Safety from Farm to Fork, which enables students to move ahead of the food safety standards in the ever-evolving agri-food industry.

Food Technology

Backed by decades of scientific research and insights, the course is delivered by TUM professors in Germany to equip students with state-of-the-art knowledge in food technology covering such topics as Food Structure and Texture Engineering, Technofunctionality of Food Components, Molecular Sensory Science, Cellular Agriculture and Molecular Biological Methods.

Sustainability

The course provides a comprehensive and in-depth understanding of the strategies and concepts of sustainability and sustainable development of the key pillars of the global food system. Students will develop the ability to apply sophisticated analytic techniques and problem-solving skills to tackle new and emerging issues with a particular focus on addressing the sustainability issues of the global food system.



Learning Outcomes

Develop critical scientific and management skills, and knowledge of key pillars of the global food system with a special focus on food technology and food safety.

Gain a comprehensive understanding of new and emerging technologies in the agri-food industry, and the development of trends, issues and challenges of the evolving landscape.

Develop analytical skills and critical thinking to institute effective changes and resolve complex challenges and issues of today's global food system while paving the way for a new generation of sustainable food to fulfil global nutritional needs.

Develop technical and management competencies such as research methodologies, data analytics, professional report writing and presentation skills as well as leadership capabilities to address today's food safety and security concerns.

Develop the necessary proficiencies to exercise critical judgement and establish high level of leadership by harnessing the scientific knowledge and skills learnt.

Develop the ability to initiate and implement strategies to provide solutions to a broad spectrum of challenges in the food value chain.

Develop the capability to assess and evaluate issues across a broad range of scientific and management disciplines and apply the skills and knowledge to institute effective structural changes and address sustainability issues impacting the global food system.

Develop a high level of critical and creative problem-solving skills capable of navigating the highly fragmented and complex nature of the food system.

Programme Structure

The Master of Science in Sustainable Food conferred by the Technical University of Munich (TUM) is carefully crafted in its course content that lends expertise in both food science and food technology, balanced out by an expanded scope in sustainability to equip our students with the necessary scientific and management competencies readied to lead at the forefront of the agri-food industry.

Jan - July

SEMESTER 2

- Food Structure and Texture Engineering (Food Design)
- Molecular Sensory Science
- Sustainability in Food Systems
- Food Toxins and Toxicants (Food Toxicology)
- Microbial Food Safety from Farm to Fork
- Molecularbiological Methods to Assess Authenticity, GMO and Veterinary Drugs in Food (elective)

July - Jan

SEMESTER 1

- Technofunctionality of Food Components
- Energy Metabolism and Regulation
- Nutrition and Microbiome in Health and Disease
- Laboratory Module
- Economic and Environmental Life Cycle Assessment (elective)

Jan - July

SEMESTER 4

- Master's Thesis

July - Jan

SEMESTER 3

- Research Internship
- Food Tissue Engineering / Cellular Agriculture (elective)

Image: © Uli Benz / TUM



Image: TUMCREATE

Programme Modules

Awarded by TUM, the MSc in Sustainable Food is a two-year full-time research and application-focused programme (120 credits) comprising 12 modules (eight core modules and four elective modules) delivered across four semesters.

Refresher Module

LABORATORY MODULE
BY: PROF. DR. MICHAEL RYCHLIK (TUM)

The laboratory module provides students with the theoretical and practical knowledge in a broad spectrum of experimental methods applied in food structure analysis, molecular biology, microbiology, molecular sensory science, analytical food chemistry and agricultural science (e.g. rheology, microbial analysis, sensory assessment, high resolution liquid chromatography). The module aims to give students a first-hand experience in their laboratory applications thus familiarising with the technical details and potential pitfall in addition to strengthening their theoretical background of these methods.

Core Modules

TECHNOFUNCTIONALITY OF FOOD COMPONENTS
BY: PROF. DR. UTE WEISZ (TUM)

This module enables students to gain an in-depth knowledge of the influence of different ingredients on the quality and functionality of food. Through review of the chemical properties of the individual food components, students will be able to deepen their understanding of their structure-activity relationships linking to their physicochemical and technofunctional properties. The module will also deep dive into essential food proteins, lipids and carbohydrates and their individual properties in detail.

NUTRITION AND MICROBIOME IN HEALTH AND DISEASE
BY: PROF. DR. DIRK HALLER (TUM)

This module provides insights into the principles of microbial ecologies specifically discussing the intestinal eco-system, and introduce measures on how to analyse changes, focusing on the response to food intake through the discussion on the anatomy and physiology of the digestive tract. In addition, the course will discuss mechanisms of micro-host interactions at the level of gut barrier functions, the mucosal immune system,



the nervous system and human metabolism. Students will also acquire a comprehensive state-of-the-art knowledge of the role of the microbiome in human health and disease such as immune-related pathologies and cancer, and metabolic disorders through discussions on the principles of immune and metabolic disorders; the role of the intestinal microbiome in regulating initiation and progression or prevention and treatment of diseases.

ENERGY METABOLISM AND REGULATION

BY: PROF. DR. MARTIN KLINGENSPOR (TUM)

The module imparts knowledge on how quality and quantity of food stuffs affect energy metabolism and the role of environmental factors and genetic / epigenetic variation in the regulation of energy balance. The integrative physiology of energy metabolism will be highlighted through the study of redundant peripheral and central control mechanisms known to regulate energy intake, turnover and storage. Students will be able to elaborate and articulate their knowledge in physiology of human nutrition and energy metabolism and know examples for pathophysiological disturbances of energy metabolism and regulation and potential treatment options.

FOOD STRUCTURE AND TEXTURE ENGINEERING (FOOD DESIGN)

BY: PROF. DR. MARIO JEKLE (UNIVERSITÄT HOHENHEIM)

The module sheds light on the principles of structures from a micro- up to macroscopic level in food systems and its functionalities. Students will gain an in-depth understanding of the development and modification of specific structures by engineering approaches with up-to-date equipment. In detail, structures in food systems and its functionality are covered, diving into the structural hierarchy and their relationship with quality aspects in food. Students will also gain a comprehensive knowledge on the innovative and emerging technologies and processes in relation to their impact on the structure of different biopolymers and its functionality in foods such as structuring by thermos-mechanical polymer approaches, and texture design by additive manufacturing.

MOLECULAR SENSORY SCIENCE

BY: PROF. DR. CORINNA DAWID (TUM)

The module delves into the principles of odour and taste perception on a molecular level to enable students to gain state-of-the-art knowledge in Sensomics. Students will advance their understanding in flavour perception, and various methods for the analysis of odour active compounds as well as the analysis of taste active compounds using the Sensomics approach to classify these substances by their aroma value or dose over threshold factor and assess their relevance in food.

SUSTAINABILITY IN FOOD SYSTEMS

BY: PROF. DR. VERA BITSCH (TUM)

This module builds on the key concepts of supply chain management, strategy and sustainability to provide students with the necessary competencies to evaluate pertinent issues in the food system. It will deep dive into the value proposition of the food system – creation and capture of added value, management of stakeholders of the food system, innovation in supply chains, sustainability as an innovation, sustainable supply chains and ethical issues in supply chain management and the food system, sustainability measurement, and the implementation of a sustainability strategy as well as costs and benefits of sustainable practices in the food system.

FOOD TOXINS AND TOXICANTS (FOOD TOXICOLOGY)

BY: PROF. DR. MICHAEL RYCHLIK (TUM)

The module provides students a solid understanding of food toxins and toxicants by delving into the fundamentals of toxicology covering toxicokinetics, toxicodynamics, and risk assessments and risk management of food. Students will deepen their scientific understanding in specific contaminants and residues in foods and the environment while developing skills to analyse and apply analytical methods, conduct risk assessment of selected compounds and groups with toxic relevance such as but not limited to mycotoxins, process contaminants, pesticide residues, heavy metals, chlorinated contaminants and emerging contaminants such as Mineral Oil Saturated Hydrocarbons (MOSH) and Mineral Oil Aromatic Hydrocarbons (MOAH).

MICROBIAL FOOD SAFETY FROM FARM TO FORK

BY: PD DR. KLAUS NEUHAUS (TUM)

The module dives into the principles of microbiological food safety focusing on modern food production systems such as aquaponics growth, and fermenter systems. Students will develop state-of-the-art knowledge in issues of microbiological threat for food safety such as bacteria, antibiotic resistance, cyanobacteria, employ risk assessment such as advanced analysis and analytical tools, and formulate mitigation strategies such as prevention of contamination and recontamination, prevention of unwanted

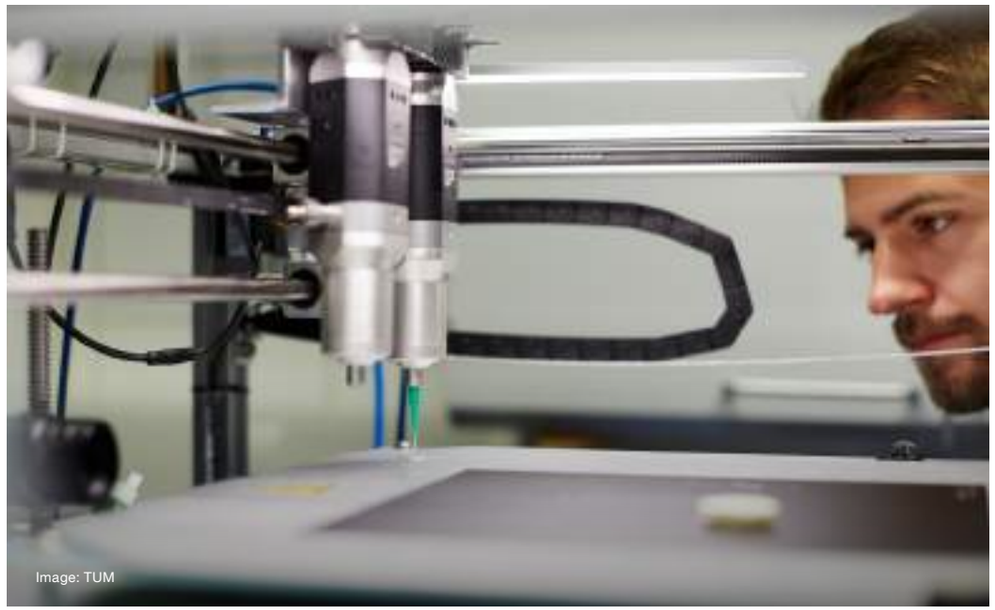

Image: TUM

bacterial toxins and prevention of food spoiling organisms to increase food safety.

Technical Elective Modules (Choose two out of three)

ECONOMIC AND ENVIRONMENTAL LIFE CYCLE ASSESSMENT

BY: PROF. DR. JOHANNES SAUER (TUM)

Using the concepts and tools of life cycle assessment (LCA), the module aims to impart students with the knowledge and skills to analyse industrial metabolisms as well as products and services regarding their environmental impacts. Students will gain a deeper understanding of the LCA methodology and procedure by applying the theoretical knowledge to a practical example, thus gaining a deeper understanding of the LCA methodology.



Image: TUMCREATE

ASSESS AUTHENTICITY, GMO AND VETERINARY DRUGS IN FOOD

BY: PROF. DR. MICHAEL PFAFFL (TUM)

The module provides insights into the molecular-biological methods and principles to detect, quantify and assess food authenticity, genetic modified organisms and veterinary drugs with focus on hormones, endocrine hormone disrupters and antibiotics in human food by both theoretical lectures and practical laboratory training. Students will be able to develop competencies in applying these molecular-biological methods and principles for a successful risk assessment and they can conclude the impact of food safety and authenticity on human health.

FOOD TISSUE ENGINEERING / CELLULAR AGRICULTURE

BY: PROF. DR. MARIUS HENKEL (TUM)

In this module, students will be introduced to the concepts of cellular agriculture, its connection to food science and the use of biotechnological methods in producing novel food. Students will acquire state-of-the-art knowledge in cellular agriculture, and apply the knowledge to evaluate individual strategies for production of biotechnological alternatives to agricultural food products such as cultivated meat including technical and environmental aspects, biotechnological efficiency parameters and critical review of the feasibility of a novel production strategy.

Non-Technical Elective Modules (Choose two out of four)

BUSINESS ADMINISTRATION

BY: PROF. DR. KASERER (TUM)

The primary purpose of the module is to introduce students to the different areas of business administration with the final objective to give them a basic understanding of how to face decision problems in a company. Most importantly, we will analyse long-term investment decisions, how to set-up strategic planning in a company, how to gather timely information about the current situation of a company, and how to set-up the long-term financial structure.

INNOVATION AND TECHNOLOGY MANAGEMENT

BY: PROF. DR. EDWARD G. KRUBASIK (TUM)

This module presents the dynamics of technological development through innovation and the related management issues, the difference between creating a new product (invention) and improving an existing product/ idea (innovation), Start-ups and financing of innovation, Innovation-driven economic cycles and Innovation impact on growth and jobs. This course is useful for students who plan to take up careers in manufacturing and service companies or in R&D organizations that make significant use of research and technology to build their portfolio.

PRODUCTION PLANNING IN INDUSTRY

BY: DR. HANS ZELTINGER (TUM ASIA)

Manufacturers are confronted by special requirements in production planning, which are difficult to handle by modern Enterprise Resource Planning (ERP) package. The module aims to develop students the ability to identify key aspects of production planning, which extends to the various arms that encompass it – ERP, Information Technology (IT), simulation, etc. as well as the responsibilities of production planning. In addition, students will also learn to approach the different stages of production planning within the industry using systems approach thinking and demonstrate the importance of software in production cycles, and discern between Strategic Business Planning, Sales and Operations Planning, Master Production Scheduling and Capacity Requirement Planning. Students will also be able to explain the different processes that go into procurement stage of production planning and articulate their knowledge by the usage of various software.

PROJECT MANAGEMENT PRINCIPLES

BY: DR.-ING ALI BAWONO (TUM ASIA)

This module introduces the principles of Project Management which addresses the key aspects of the project management processes and frameworks for successful projects. The skills and understanding of principles of project management is a key for the project manager to lead, plan, and implement projects to help their organisations succeed by achieving the common objectives within designated scope, cost, and timeline. The module introduces tools, techniques, and frameworks used to engage effective stakeholders' communication, monitor the project life cycle, and consistently develop the project with its deliverable. In this course, the student will learn how to initiate, manage, monitor, and then close the project. Students will also gain an understanding of predictive and adaptive approaches commonly used in various projects and various industries.



Image: TUMCREATE

Internship & Master's Thesis

Internship

The internship programme is one of the hallmarks of all TUM Asia's master's programmes designed to provide structured and supervised work experiences, bridging theoretical knowledge with practical application. Beyond academic pursuits, the internship serves as a excellent platform for soft-skill development in a real-world setting, aiding students in attaining the required management and scientific proficiencies to realise their career aspirations

Students complete a four-month internship with the industry or an academic institution of choice related to his or her field of study at TUM Asia.

Internship can be completed anywhere in the world.

Students are empowered and given the freedom to pursue internship in their desired fields anywhere in the world and explore the possible career pathways developed from their field of study based on their career goals and aspirations. Students who have secured a scholarship with their sponsoring company will undergo their internship in the company, which can be conducted in any branch of the company worldwide).

Master's Thesis

The six-month master's thesis is a culmination of graduate work and an opportunity to apply the knowledge and skills that students have acquired through course work and research assistant-ships.

Through this guided learning experience, students work in collaboration with industry partners or other researchers on a project of mutual interest and gain the opportunity to publish manuscripts resulting from the thesis.

The master's thesis is fully practical-based. Theoretical frameworks or conceptual models can be occasionally used to guide research questions.

Scholarships

At TUM Asia, we are committed to fostering academic excellence by supporting students in their pursuit of knowledge to unlock potential, and empowering them to make enduring contributions for the future.

We offer a variety of scholarships and grants designed to recognise students who have demonstrated exceptional achievements and aptitude, ensuring talented individuals the opportunity to pursue their aspirations regardless of their financial situation.

Academic Distinction Scholarship

Awarded to high-calibre candidates enrolled in any of TUM Asia's master's programmes who have demonstrated outstanding academic achievements

ASEAN Scholarship

Awarded to exemplary candidates from ASEAN countries enrolled in any of TUM Asia's master's programmes who have exhibited outstanding leadership qualities, good character and exceptional academic performance

Women in STEM Scholarship

Awarded to exceptional female candidates enrolled in any of TUM Asia's master's programmes who have demonstrated strong leadership qualities and potential in personal endeavours

TUM Asia-DAAD Scholarship

Funded by German Academic Exchange Service and awarded on a per-semester basis to TUM Asia's students who have achieved academic excellence and demonstrated strong aptitude

Disclaimer: All scholarship applications that have fulfilled the respective eligibility criteria are subject to evaluation by the Scholarship Committee. Terms and conditions apply.

Image: © Uli Benz / TUM

Career Prospects

Taking a judicious approach in supporting our students' long-term growth, our master of science programmes are continually refreshed to ensure our robust curriculum is competitively aligned with industry needs.

The increasingly interconnected and globalised world that spurred a wider variety of food crossing the globe and finding its way to various corners of the world has consequently thrust global food security and food systems to the fore. Graduates of the Master of Science in Sustainable Food is highly sought after in a wide spectrum of deep-tech careers in the food science and technology industry to address the evolving challenges present in today's world.

To effectively integrate the highly fragmented and interconnected architecture governing the various aspects of the global food system, graduates who have developed an advanced level of the scientific knowledge and insights of the food technology landscape will also be needed at the policy level to provide effective governance across the various pillars of the food system and establish ethical standards to pave the way for a new generation of novel food.

Graduates will see themselves through successful careers in various fields, including food science, food technology, public health, and environmental sustainability. The main employers of graduates are food manufacturers, producers, processors and retailers ranging from global multinational companies to small-to-medium science businesses delving in novel foods, plant proteins, etc.



- Alternative Protein Food Application Scientist
- Food Product Formulator
- Protein Texturisation Expert
- Food Toxicologist
- Food Technologist
- Data Scientist
- Novel Food Biotechnologist
- Product or Process Development Scientist
- Research Scientist (Life Sciences)
- Food Safety Analyst
- Health and Safety Specialist
- Nutritionist
- Food Quality Manager

Industry Outlook



S$10.8 trillion
Projected food spending in Asia by 2030[1]

31%
Global food technology market share dominated by Asia Pacific[2]

S$391 billion
Projected annual investment by 2030[3]

7%
Global food market growth per year[4]

[1] Economic Development Board Singapore
[2] Global Market Insights
[3] Dairy News Global

Novel Food Biotechnologist Alternative Protein Food Application Scientist
Two of the 27 occupations listed in Singapore's Shortage of Occupation List (SOLs)[5]



27 tons
Projected daily amount of plant-based meat produced in Singapore by 2030



180
Projected number of highly skilled workforce required in the alternative proteins and novel food sector in Singapore[6]



USD 2.13 billion
Market size of meat substitutes in China[7]



20%
Compound annual growth rate (CAGR) by 2027[7]



S$60 million
Dedicated to support Singapore farms in building and expanding their production capacities and capabilities through Agri-food Cluster Transportation (ACT) Fund[8]



[5] Ministry of Manpower Singapore
[6] Good Food Institute
[7] Mintel

Singapore

The Gateway to Global Success

A RICH PORTFOLIO OF KEY ENABLING INDUSTRIES

Singapore remains one of Asia's economic powerhouses, boasting a diversified portfolio of thriving industries from aerospace, energy and chemicals to logistics and supply chains.

>130 Aerospace Players

Home to one of Asia's largest and most diverse aerospace ecosystems with over 130 players, the country also plays host to 30 aerospace firms, such as Inmarsat.

Ranked Asia's Top Logistics Hub

Singapore offers world-class connectivity to the region and is consistently ranked Asia's top logistics hub by the World Bank.

World's Leading Energy and Chemical Hubs

Singapore is also one of the world's leading energy and chemical hubs, with over 100 global chemical firms operating here.

A Diverse Community of Semiconductor Firms

From foundries to manufacturing plants, small and mid-sized firms to global giants, Singapore brings together a diverse community of semiconductor firms. With an output of US$64.8billion the electronics sector accounts for 31.6% of Singapore's total manufacturing output.

Leading Hub for Agri-Food Technology and Innovation

As Singapore moves towards its national "30-by-30" goal to produce 30 per cent of its nutritional needs locally by 2030, Singapore's strong governmental support to establish an ecosystem of food technology and innovation has propelled the country as an ideal location to connect with like-minded food innovation partners, design food products to cater to Asian palates, safeguard intellectual property, scale technology-intensive infrastructure and a launchpad for tech start-ups in the alternative proteins arena.

DID YOU KNOW?

Innovators can fast track their entrepreneurial journey and professional connections by plugging into Enterprise SG's Startup SG Network, a platform dedicated to local tech players to connect to a global community of more than 3,000 startups, 500 investors, 200 incubators and accelerators.

TUM ASIA

Launchpad to Global Opportunities

TAKING THE FIRST STEP TO GLOBAL SUCCESS

World's Top 30 University

Consistently ranked world's top 50 university in global rankings such as Quacquarelli Symonds (QS), and Times Higher Education (THE), TUM is also ranked as #1 university in Germany and the EU, with 18 Nobel Laureates under its belt.

ONLY OVERSEAS CAMPUS OF Technical University of Munich (TUM)

Nestled in the economic epicentre of Asia, TUM Asia is the only overseas campus of TUM where students get to immerse and develop an appreciation of a decades-long legacy of German education, while gaining the experience of living in a cosmopolitan city not too far from home.

A CONFLUENCE OF East and West

Taught by professors and industry veterans from Germany and Singapore, our programmes are designed to equip students with deep academic knowledge connected to real-world contexts in Asia and Germany.

Global Network

Widely connected with industry partners in Asia and Germany, students are able to tap into TUM and TUM Asia's industry network to find their ideal launchpad to greater and wider

Small Student-Teacher Ratio

At TUM Asia, classes are intentionally designed in small clusters of less than 40 students to enable students to gain the full and dedication attention of our professors while thrive in a lively in-depth discussion with their peers.

Block Learning

Condensed in teaching blocks, students learn one specialised topic, enabling students to immerse and deepen their understanding of the subject.

About TUM

#1 University in Germany[1]

#1 University in EU[1]

#25 in the World[1]

#13 in Global Employability Survey[2]

#1 in Germany for 8 academic subjects[1]

[1] QS World University Rankings 2027
[2] The Global University Employability Ranking 2026

Programme Fees

PROGRAMME FEES

Registration Fee[+] Per application	Before GST SGD 5,000	After GST SGD 5,450
Tuition Fee[+] Sustainable Food	Before GST SGD 35,500	After GST SGD 38,695

For more information, please visit:
https://tum-asia.edu.sg/graduate-studies/

THE FULL APPLICATION PROCESS AND DOCUMENTS REQUIRED FOR SUBMISSION ARE AVAILABLE ON **HTTPS://TUM-ASIA.EDU.SG/ADMISSIONS/GRADUATE-STUDIES/APPLICATION/**

APPLICATIONS OPEN ON 1 OCTOBER EVERY YEAR.

ADMISSION CRITERIA

- Bachelor's degree in Food Science/Technology/Engineering/Nutrition/Safety/Sustainability or its equivalent in Science/Technology/Engineering or a closely related discipline
- Bachelor's degree certificate or enrolment letter (if you have not completed your bachelor's degree)
- Academic transcripts or mark sheets, including the credits/grading system of your university
- State of purpose indicating the reason(s) you are interest in this programme
- Curriculum Vitae / Résumé
- Test of English as a Foreign Language (TOEFL) test score (≥ 88 for Internet-based test, DI Code: 7368) or
  International English Language Testing System (IELTS) test score (≥ 6.5 overall) taken no more than two years ago from date of submission
- Akademische Prüfstelle (APS) certificate for applicants who hold a degree from China, India and Vietnam

Disclaimer: The Master of Science in Sustainable Food is subject to the proviso that the Bavarian State Ministry of Science and the Arts has no objections

TUM Asia

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All information is accurate at the time of printing and is subject to change without prior notice.

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