

**The Hong Kong Academy of Sciences and
The Hong Kong Young Academy of Sciences joint
Written Submission on Innovation and technology development and
re-industrialisation policy in Hong Kong**

The Hong Kong Academy of Sciences (the Academy) was established in 2015 by a group of distinguished and successful scientists in Hong Kong. Membership of the Academy is the highest academic honour for scientists in Hong Kong that can be bestowed by their peers. The Academy promotes the development, advancement and teaching of science and technology to raise the city's profile as a centre of scientific excellence. It also organises science popularisation activities to enhance the interest and awareness of the general public in the field. To inform and advise the Government and the public, the Academy also conducts independent studies on policy matters in science and technology. In 2018, the Hong Kong Young Academy of Sciences (the Young Academy), being a chapter of the Academy, was established to advocate the improvement of working conditions for young scientists and leverage their energy, capability and enthusiasm to promote science and technology.

In this written submission, the Academy and the Young Academy would like to share with the C&I Panel the following recommendations for improving the science and technology development in Hong Kong.

1. Supporting the Government's initiatives on Innovation and Technology development and re-industrialization

The Government has recently committed substantial resources and initiated influential facilitating policies to encourage and support research and development of innovative technologies and their applications. The purpose is to re-energise traditional industries as well as to promote advanced manufacturing industries. We are beginning to see and experience the emergence of a more innovation and technology friendly societal culture and the first fruits of the efforts. The Academy fully supports these policies as an effective way of broadening the economy base of Hong Kong for a more sustainable and steady development and encourages their continuation and deepening. The recent global geopolitical developments which may dampen

the speed of development of Hong Kong as an international financial hub further highlights the need for broadening our economy base.

2. **Coordinated and balanced funding support for all tiers of R&D**

The funding for reviving and upgrading manufacturing industries in Hong Kong is mainly provided through the Innovation and Technology Fund. The fund is administered by the Innovation and Technology Bureau and focused on midstream and downstream R&D activities. On the other hand, funding for upstream R&D is administered by the Education Bureau and advised by the University Grants Committee and the Research Grants Council for the purpose of promoting excellence in the higher education sector. The incongruence in administration and priorities may cause mismatch between the lower stream R&D and the upstream basic research. Inefficiency, delays and wastes are inevitable results caused by the lack of dovetailing. To promote synergy and the development of a comprehensive R&D ecosystem in which all necessary services, talents and knowledge are readily available, the Academy recommends the pooling of funding for all tiers of R&D to form an independent funding commission. Furthermore, this arrangement will facilitate the identification of advantageous niches in science and technology and on which the limited available resources are focused to enable Hong Kong to assume a world leading role in those niches.

It should also be pointed out that while midstream and downstream R&D are important, upstream basic research is extremely important because it lays the foundation for major discoveries. Today's ubiquitous social media, electronic appliances, smart gadgets, and targeted therapies for disease treatment are all made possible by basic research carried out for many years in the past. Providing sufficient funding today to upstream basic research will enable tomorrow's flourishing industrial applications based on its findings.

To support the Guangdong-Hong Kong-Macau Greater Bay Area Initiative also calls for an increased Government funding for more upstream basic research in Hong Kong. As Hong Kong is equipped with top-ranking universities in the world, and a pool of internationally acclaimed scientists and researchers, Hong Kong should leverage this advantageous position to intensify upstream basic research in order to support and dovetail with the midstream and downstream R&D activities carried out in the manufacturing base located in other parts of the Greater Bay Area.

3. **Recognition of inherent value of R&D activities**

R&D activities, irrespective of whether they are upstream, midstream or downstream, by its very nature, are risky activities as it is likely that the desired outcomes may not be achieved because of the complicated interactions between a large array of unforeseen and unknown factors. Too much emphasis on the need of success will drive researchers to languishing on straightforward mundane topics with limited potential rewards while shunning high-risk, high-reward pursuits. If Hong Kong continues to place over-emphases on the value of success, it will lose out for a lack of researchers dared to brave bleeding edge research fraught with failures. Yet, a research project which cannot achieve the desired outcome is not necessarily a failure, and in many cases, it can even be a great success. For example, Robert Wilson and Arno Penzias failed to eliminate the persistent noise at microwave frequencies picked up by their horn antenna used to analyse the radio signal from intergalactic spaces, but in the process, they discovered in 1964 the cosmic microwave background radiation which confirmed the Big Bang theory about the origin of the Universe. The discovery was dubbed the greatest scientific discovery of the 20th century and they won the 1978 Nobel Prize in Physics. In the process of R&D, invariably, new knowledge will be found, new processes developed, talents trained, and supporting services and supplies established. All these are essential elements of a comprehensive ecosystem critical to the success of subsequent R&D activities. Indeed, these by-products may sometimes be even more valuable than the intended outcome.

4. **Cultivate a culture favourable to science and technology development**

To attract young talents into a profession and retain them within the profession, the status of that profession within the society is crucial. Yet, in Hong Kong, due to the long-term negligence of science by the society, scientist as a profession is not among the top professions young people aspire to join. Most top-quality students will not apply to study sciences in local universities. The more disheartening is most science students will not take up jobs in scientific research and development when they graduate. Lack of talents and new blood is not conducive to developing Hong Kong into a top tier technology innovation hub.

To reverse this trend, the Government should embark on an extensive campaign to raise the status of scientist as a respectable and influential profession, starting from primary and secondary schools and gradually extend it to the whole community. To set an example, like the Chinese Central Government, the Government should itself provide formal recognition to successful scientists, including members of the Hong Kong Academy of Sciences, e.g., by assigning them suitable positions in the Hong Kong SAR precedence list.

The Government should also recognise the Academy as the top institution of local scientists. Recognition may be provided by establishing the Academy as a statutory body and provide resources, including a permanent home, for it to pursue its objectives. This action will speak volumes to the public that science is fundamental to the society and will play a pivotal role in the future of Hong Kong. On policies and other important issues relating to science and technology, the Government should consult the Academy to show respect to scientists and to leverage the knowledge of its members.

Indeed, the top science academies of many places are recognised, held in high regard and funded by the local governments. For example, in the mainland, the Chinese Academy of Sciences was established on 1 November 1949, shortly after the establishment of the new Republic. It is funded by the Chinese Central Government, acts as the top advisory body and takes a key role in China's science and technology development. Across the Pacific in the USA, the National Academy of Sciences was founded in 1863 as a result of an Act of Congress approved by Abraham Lincoln, and charged with providing independent, objective advice to the nation on matters related to science and technology. The respect afforded by the two biggest economies in the world to national science academies clearly demonstrates the indispensable roles they play.

5. **Setting up of independent vertically integrated and sizable R&D institutes for selected advantageous niches**

Hong Kong is a small and open economy with a very limited pool of talents, to be successful in science and technology under intense world competition, it must focus its resources in selected advantageous niche segments. We recommend the Government to set up vertically integrated and sizable R&D institutes in selected niche segments, e.g., biomedicine, to amass top researchers from various universities and focus on a small number of cutting-

edge research topics and to take on grand challenges of relevance with an aim to translate discoveries into applications. These institutes will have researchers holding joint academic appointments with universities. They will be physical centres to attract and retain the best researchers within and outside Hong Kong, to nurture future generations of researchers and to serve as a nucleus for collaborations with industries and other research institutes. The institutes will also act as centres of excellence to boost the status of Hong Kong in science and technology and attract young talents to join the profession.

While these institutes, when matured, will be self-sustainable through licensing their research and development findings and know-hows as well as providing proprietary R&D services, the Government must provide ample seed funding in their initial years for them to establish a strong foothold in face of fierce world competition.

6. Adjusting the DSE curriculum to facilitate the nurturing of young talents in science and technology

Nurturing young talents is vital to sustaining and expanding Hong Kong's development in science and technology. A flexible and up-to-date education system is the key. In Hong Kong, career prospects in science, technology, engineering and mathematics are generally believed to be less attractive than in finance, accounting, law and medicine. This makes it even more imperative for the Government to review the DSE curriculum to facilitate and encourage students to study science and pursue research in science and technology.

In 2017, the Academy carried out an extensive study and published a report titled "Science, Technology and Mathematics Education in the Development of the Innovation and Technology Ecosystem in Hong Kong". The report recommended the Government to take the following actions:

- a. Trim the Core Subject requirements to achieve a balance between science and non-science education.
- b. Introduce module flexibility to provide choice for students in choosing science subjects.
- c. Give proper recognition to advanced Mathematics to stimulate enrolment.

- d. Universities to review the “3-3-2-2” common minimum entrance requirement and individual programme admission requirements to encourage students to take more science subjects.
- e. Confer a diploma of secondary school education to students who have attained the necessary core skills and knowledge essential to prepare them for further study or career development. This effectively decouples secondary school education from tertiary admission and manifests its unique and irreplaceable value.