

# Joint Funds of National Natural Science Foundation of China: Strategy, Practice, and Development

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**Abstract:** Joint Funds of National Natural Science Foundation of China (NSFC) are initiated by different stakeholders, which aim to play a better guiding role to support basic research in specific areas and directions. They have formed an important part of the national natural science funding system, which is responsible for advancing science and technology in an expanding frontier. The article would briefly summarize the joint funds strategic goals, programs implementation and achievements in the past decade, and provide a perspective on their future development.

**Key words:** Joint Funds, Strategic goals, Practice, Development

## 1 Introduction

Since the founding of the National Natural Science Foundation of China (NSFC), especially since the implementation of the work principles of joint funds programs at 2001, the Joint Funding work has attained universally acknowledged achievements. The Joint Funds mainly focus on national interests as well as scientific frontier and aim to attract researchers from different sectors of industries, universities and research institutes to enter full-fledged cooperation so that they can promote the conversion from knowledge to technology, provide better and more extensive services to economic and social development at the national and regional levels.

Partnerships catalyzed between academia, industry, and the government throughout China shape Joint Funds programs. NSFC creates strategic collaborations with other agencies, academia, and the provincial governments to enable the translation of fundamental research to usable contexts as rapidly as possible. In addition, the joint funds broadly support local basic research, particularly at under developed district and minority nationality regions in China, offers not only a key source of funds for discovery in many fields, but also valued stewardship in developing the next generation of talents.

So far, some scholars have discussed NSFC joint funding activities, and most of them are focused on the funding execution and performance evaluation, but the panoramic study NSFC Joint Funds is rare. Based on NSFC Internet-based Science Information System statistics from 2001 to 2011, the current funding situations of Joint Funds are quantitatively analyzed in this article.

## 2 Joint Funds Strategic Goals

Joint Funds of NSFC have three interrelated strategic goals: Promoting the Cooperation, Fostering Scientific and Technological Talents, and Enhancing Chinese Indigenous Innovation Capabilities, which grow from NSFC's mission and our expectations for leadership and excellence in carrying it out. These goals provide the

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programmatic and operational underpinning for all Joint Funds programs and activities.

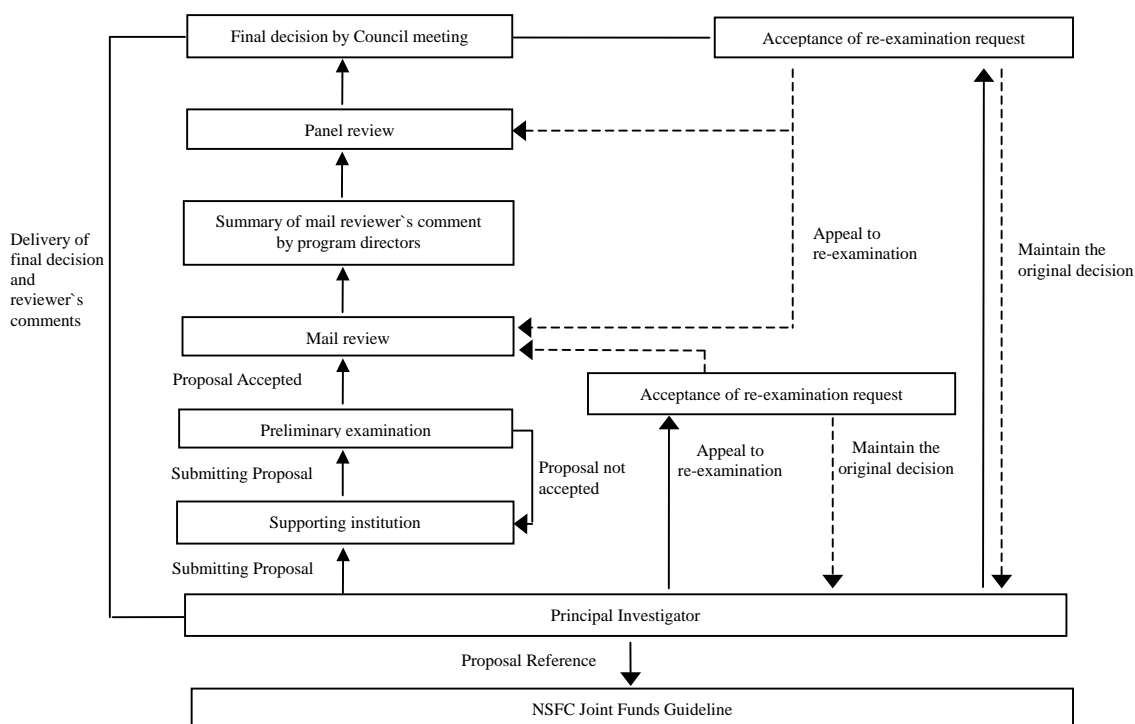
Promoting the Cooperation emphasizes the seamless integration of research and economy as well as the close coupling of scientists and enterprise. The Joint Funds program dedicates to attract multiple resources from different sectors to support basic research, in so doing, to promote the combination of science and technology and economy, as a result, form an enterprise-led technology innovation system featuring the combination of enterprises, universities, and research institutes.

Fostering Scientific and Technological Talents means to make unremitting efforts to build a large, well-structured, high-quality, inter-disciplinary science and technology workforce compatible with economic and social development and national defense work so as to ensure the talents and knowledge base for the nation's science and technology development.

Enhancing Chinese Indigenous Innovation Capabilities points to improve original innovation, integrated innovation, and re-innovation based on assimilation and absorption of imported technology, thus boosting our national innovation capability. It depends even more heavily on science and technology progress to achieve substantial gains in productivity and advance the overall economic and social development in a coordinated and sustainable manner, ultimately aims to drastically heighten the national comprehensive strength.

### 3 Joint Funds Implementation and Achievements

Meeting the challenges of our strategic goals requires the Joint Funds action across many dimensions. Above all, NSFC program staff to fund activities including both disciplinary and interdisciplinary projects use multidimensional criteria for funding decisions based on the merit-review process, as shown in flow chart 1 below.



**Chart 1 Diagram of the NSFC Joint Funds Merit Review Process**

The peer review system of the Joint Funds is based on international research council practice, in line with Chinese actual conditions. The research proposal selection process, which has a system of checks and balances in

place, is widely seen as the best in China. According to the survey, applicants largely agreed with the results of the peer reviews.

**Table 1 Statistics of NSFC Joint Funds**

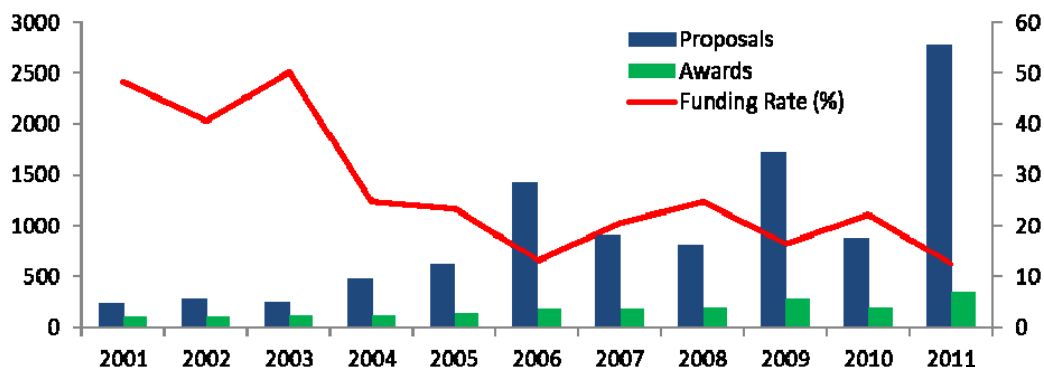
JOINT FUNDS TITLE	STAKEHOLDERS	DURATION OF AGREEMENT	PERFORMANCE
NSAF Joint Fund	China Academy of Engineering Physics/NSFC	3terms, 13years	Ongoing
Joint Fund of Astronomy	Chinese Academy of Sciences/NSFC	2terms, 6years	Ongoing
Huanghe Joint Fund	Yellow River Conservancy Commission of the Ministry of Water Resources/NSFC	1term, 3years	Accomplished
Joint Fund of Research on Major Science Facilities	Chinese Academy of Sciences/NSFC	2term, 6years	Ongoing
NSFC-Guangdong Joint Fund	People`s Government of Guangdong Province/NSFC	2terms, 8years	Ongoing
NSFC-Yunnan Joint Fund	People`s Government of Yunnan Province/NSFC	1terms, 5years	Ongoing
Joint Fund of Civil Aviation Research	Civil Aviation Administration of China/NSFC	3terms, 11years	Ongoing
Joint Fund of Iron and Steel Research	Baosteel Group Corporation/NSFC	4terms, 12years	Ongoing
Joint Fund of Coal Research	Shenhua Group Corporation Limited/NSFC	1term, 3years	Ongoing
NSFC-Henan Talent Development Joint Fund	People`s Government of Henan Province/NSFC	1term, 5years	Ongoing
Promote Cross-Strait S&T Cooperation joint fund	People`s Government of Fujian Province/NSFC	1term, 5years	Ongoing
NSFC-Shandong Ocean Science Research Center Joint Fund	People`s Government of Shandong Province/NSFC	1term, 5years	Ongoing
Express Railway Basic Research Joint Fund	The Ministry of Railway/NSFC	1term, 4years	Ongoing
China Engine S&T Medium- and Long-Term Development Strategic Research Joint Fund	Chinese Academy of Engineering/NSFC	1term, 5years	Ongoing
Joint Fund of Petrochemical Engineering	China Petrochemical Corporation/NSFC	2term, 5years	Ongoing
Joint Fund of Yalongjiang Hydropower Development Research	Ertan Hydropower Development Company/NSFC	1term, 2years	Accomplished
Energy Conservation and Environmental Protection Joint Fund	China Energy Conservation and Environmental Protection Group /NSFC	1term, 3years	End
Aviation S&T Joint Fund	No.1 Aviation Industry Corporation of China/NSFC	1term, 3years	Accomplished

Source: NSFC Internet-based Science Information System.

From 2001 to 2011, eighteen different types of Joint Funds have been established successively (Table 1). Each Joint Fund has its specific rules of participation and funding. Furthermore, all the results generated from the Joint Funds, such as papers, patents and awards, should all bear the NSFC project number or relevant statement.

Since then, a total of over 83,500 proposals were submitted and reviewed, with 15,917 applications were awarded. Figure 1 shows the change in the number of proposals, number of awards, and funding rates through time. It indicates the amount of proposals increase in a mass and the funding rate continually decrease in the past

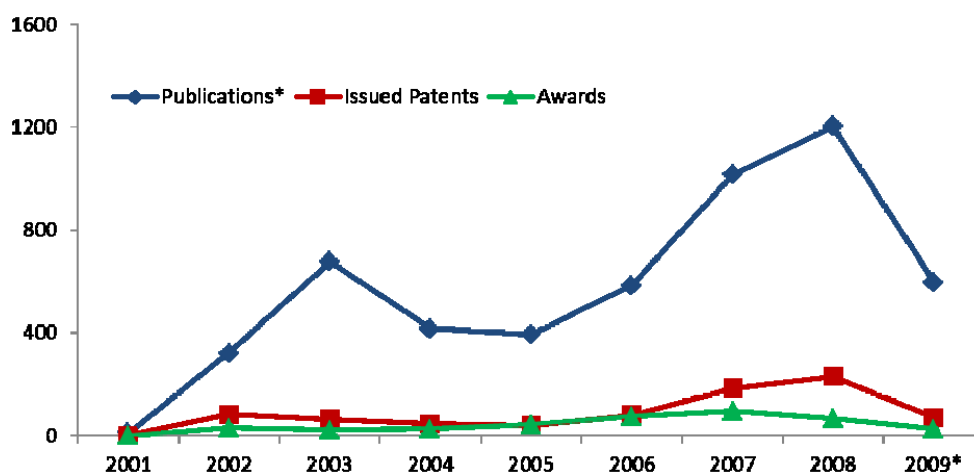
eleven years.



**Fig.1 Joint Funds Proposal, Award, and Funding Rate Trends**

Note: a proposal is included in a given year based on the proposal was accepted in that year.  
Source: NSFC Internet-based Science Information System.

Web of Science indexed Chinese publications grow fast in recent years, among of them, more than 5200 papers were funded by NSFC Joint Funds. It is interesting to note that it had a huge spike in the number of papers published in 2007-2008, jumping from 585 in 2006 to 1204 in 2008, and it fell drastically in 2009. Patenting activity is widely viewed as an indicator of a country's innovative capacity. It is counted that total 805 patents have been subsidized by the Joint Funds. The analysis in Figure 2 exhibit that the amount of issued patents showed a gradual progress, with a constant increase in the number of patents assigned from 2001-2008, and there is a visible reduction in the next year. There are 382 awards granted to Joint Funds programs, which contain 7 National Natural Science Awards 2nd class, 12 State Technology Invention Awards and 34 National Science Progress Awards.

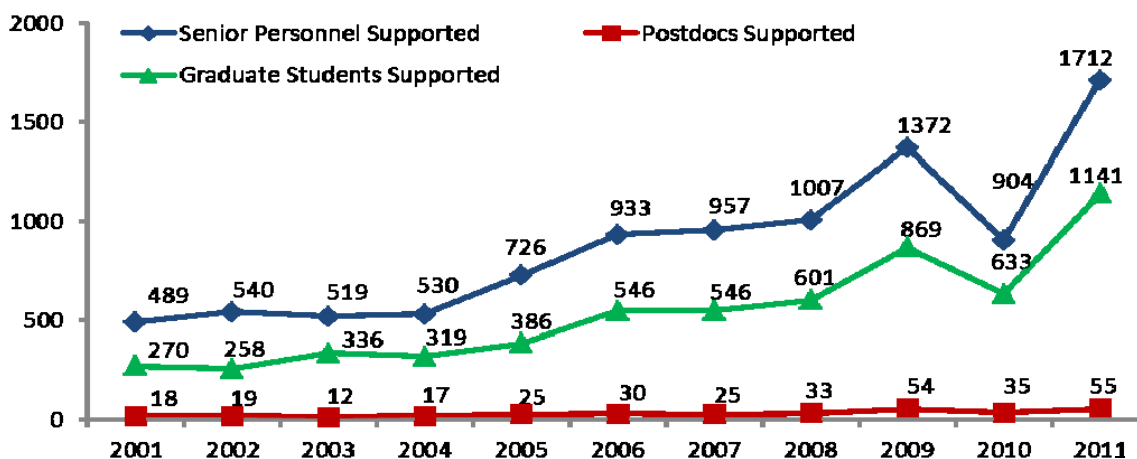


**Fig.2 Number of Publications, Patents, and Awards Funded by Joint Funds**

Note: publications include SCI-index paper only.  
Source: NSFC Internet-based Science Information System.

Modern scientific research more often than not is not only performed by an individual researcher, which, of course remains crucial, but also through a team effort. NSFC Joint Funds pay much attention to foster the young scientists in a research group, and the crucial members of such teams are Ph.D. students and postdoctoral fellows.

Figure 3 provides the number of graduate students, postdoctoral associates, and senior personnel supported on NSFC Joint Funds research grants. According to statistics, an estimated 15,917 senior researchers, post-doctoral associates, and graduate students across all levels were directly involved in NSFC Joint Funds research programs and activities. However, the quantity of postdoctoral researchers was much less than the other two groups. These data were extracted from the budget details of research grants active in each year.



*Fig.3 Number of People Supported on NSFC Joint Funds Research Grants*

Source: NSFC Internet-based Science Information System.

#### 4 Joint Funds Prospects

First of all, the Joint Funds orientation is very important for the further development. NSFC uses a lot of funding instruments, 24 in total, to meet the needs of various specific target groups as well as medium-term and long-term strategic objectives. However, the trend of programs similarity is the present great challenge to Joint Funds development. It might stir up serious harm to Joint Funds progress over time. Consequently, it is absolutely essential to clarify the relationship with other programs, especially the difference. In parallel, inter-joint funds programs coordination mechanism should be established for this purpose.

Secondly, the Joint Funds should intensify efforts in attracting scientist's application. The number of proposals submitted to NSFC more than 150,000 in 2011, at the same time, Joint Funds had only 2,770 applications, which are far below 76,062 applications of the General Programme and 54,091 applications of Young Scientists Fund. Therefore, it is necessary to take measures, for example, to improve funding rate and intensity, for the sake of raising applications amount.

Thirdly, the Joint Funds program evaluation criterion need to be optimized. For instance, the dissemination of research achievements, usually the issued patents, should be made an important factor for qualifying the programs performance and award. Large amount of scientific papers which supported by Joint Funds have been published, nevertheless, the quality measured as a Bibliometric Relative Impact Indicator is still somewhat below the world average. Accordingly, it is worth to seeking new quality norms in relation to performance promotions.

Last, but certainly not least, are the issues of postdoctoral fellows. Modern research requires an inheritable culture and responsibility to mentor young people into a direction that suits their talents. However, poor pay and conditions mean that it is difficult to recruit and retain the best post-docs in China. It is strongly recommended

that Joint Funds should give beneficiaries more flexibility in using grant funding, in order to employ excellent postdoctoral fellows in the programs.

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