

APEC/MRCWG SAKE-2006 proposal

APEC PROJECT FORMAT

Facesheet

Project seeking APEC funding

Operational Account

Project number:		Date received by Secretariat:	
Name of Committee/Working Group: Marine Resource Conservation Working Group			
Title of Project: Satellite Application in Knowledge-based Economies (SAKE)			
Proposing APEC Economy: Chinese Taipei			
Co-sponsoring APEC Economy(ies): Indonesia; Philippines			
Project Overseer: Name, Title and Organization (M/F) Dr. Gwo-Dong Roam (M), Director General, Office of Science and Technology Advisors Environmental Protection Administration, Chinese Taipei			
Postal address: 41, Sec. 1, Chung-Hwa Road Taipei, Chinese Taipei		Tel: 886 2 23822841 Fax: 886 2 23115486 Email: gdroam@sun.epa.gov.tw	
Financial Information	Total cost of proposal (US\$): 151,670	Amount being sought from APEC Central Fund (US\$): 45,390	
Type of Project: <input checked="" type="checkbox"/> seminar/symposium <input checked="" type="checkbox"/> short-term training course <input type="checkbox"/> survey or analysis and research <input type="checkbox"/> database/website <input type="checkbox"/> others <i>(Please specify)</i>			
Project start date: 2006 January 1		Project end date: 2007 June 30	
Brief description of Project: its purpose and the principal activities (including when and where) : The objective of this project is to improve the capacity of APEC developing economies in the development and management of current and future marine-related activities through the use of high-resolution satellite imagery. This improvement in capacity will assist: <u>academia and research communities</u> to better understand ecosystem interactions towards identifying opportunities to implement conservation measures for the protection of marine and coastal resources; <u>government managers</u> to monitor marine-related activities towards identifying polluters and other illegal uses of the sea and its resources; and, the <u>business community</u> to identify, manage and monitor business opportunities in marine and coastal areas – including ecotourism, aquaculture, mariculture, fisheries, marine parks, pipeline and cable laying, shipping and transportation, coastal protection, marine emergencies, etc. Many developed economies currently enjoy these capacities however, this project intends to accelerate improved capacity amongst developing APEC economies.			
Signature of Project Overseer: Gwo-Dong Roam			
<i>(Separate written confirmation acceptable for email submission)</i>		Date: July 15, 2005	

Signature of Committee Chair/WG Lead Shepherd: *(Not applicable to Progress Report and Evaluation Report)*

(Separate written confirmation acceptable for email submission)

Date:

Proponent

CHINESE TAIPEI

Co-sponsors:

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A. Project Design

Project Objectives

- 1) **Describe briefly the objectives and how you will measure your results (in the short and longer term) to know if your project has been successful. (You must provide detailed assessment measures in paragraph 22)**

The **objective** of this project is to promote the development of knowledge-based economies with the help of satellite images. The method is to encourage the use of satellite images in the design, development, or monitoring of marine-related economies by providing free satellite images. Satellite images of high ground resolution are commercially available, but too expensive for most potential users. The high cost of satellite images hinders their contribution to improve research in knowledge-based economies. This is especially true in marine-related economies that cover a large surface area, as satellite images over water cost a lot more than over land. The participants of the project must present their results of utilization of these free satellite images and the **success** of this project hinges on their **participation** at the start, **building capacity** of integrating satellite images into economic activity, and their **accomplishments** in their final reports.

- 2) **How, briefly, does this project respond to the priorities set by APEC Leaders and Ministers, Please make reference to the relevant parts of the APEC Action Agenda including Action Program, work plan, vision statement, and policy statement that relate to this project.**

In the Osaka Action Agenda on Marine Resource Conservation, the Common Policy Concept is “The marine environment contributes substantially to the economic viability of APEC economies through trade in fisheries and aquaculture products, other marine commodities and tourism. These are dependent on active conservation of marine resources and the marine environment, degradation of which has significant socioeconomic costs. While enhancing trade and investment in marine products, APEC economies will aim to protect the marine environment and to ensure continuing socioeconomic benefit. APEC economies will set priority on the following:

- a. addressing coastal zone planning and management;
- b. enhancing coordination in the implementation of relevant UNCED recommendations;
- c. reviewing and resolving marine algal toxin issues.

(<http://www.mofa.go.jp/policy/economy/apec/1995/agenda.html>)

This project aims at capacity building towards coastal zone planning and management that may include ecotourism, mariculture, development and utilization of coastal zone, monitoring of land-based pollution, etc.

In the APEC Ministerial Meetings, it was emphasized that a “clean ocean” should be maintained along with economic development. Most marine pollutants are either land-based or ship-originated. Except in the case of rivers, most

land-based polluters are concentrated in specific areas. Survey by foot is suitable for collecting on-site samples on land, but is unsuitable for providing background information or for monitoring of coastal waters inaccessible by car.

Recommendations from the APEC Oceans Conference (October 14-16, 1998; Honolulu, Hawaii, U.S.A.) are:

- (1) Implementing APEC Action Plan on the Sustainability of the Marine Environment,
- (2) Balancing Coastal Development and Resource Protection,
- (3) Ensuring Sustainable Fisheries and Aquaculture,
- (4) Understanding and Observing the Oceans and Seas, and
- (5) Economic and Technical Cooperation (ECOTECH)

This project responds to these recommendations, because the provided satellite images are available to users in government, academia, and business sectors, and they contain information pertaining to the different themes included in the above recommendations.

The benefits of high-resolution satellite images in promoting business may be exemplified with the following. First is the assurance to the managing agencies on balancing the promotion of ecotourism and the conservation of natural resources. To support ecotourism in coastal waters (say, a marine park), one should provide basic information on the coastal environment. This information may include water quality (like water clarity and nutrient content), meteorology (like wind speed and direction, air temperature), hydrography (like waves, currents, and water temperature). To supplement these point-wise data, a satellite image is more persuasive in promoting ecotourism. The private industry may use satellite images to attract customers, because customers will know exactly which part of the park they are enjoying. Hence, a satellite image is useful to the management, to the private business and to the general public.

Similarly for the management of mariculture, the goal of maintaining a clean marine environment (“clean ocean”) is easily fulfilled while promoting the mariculture industry. A high-resolution satellite image can easily show the number and extent of fish pens, and the water affected by these fish pens.

This project also supports the implementation of the priorities of “interaction with civil society, academics and business” as stressed by Canada during the APEC 2002 Summit.

(<http://www.dfait-maeci.gc.ca/canada-apec/priorities-en.asp>)

3) For applications under the TILF Special Account:

N.A.

Linkages

- 4) **Who are the intended beneficiaries in member economies of the project. Highlight the direct benefits to the institutions / the types of business in member economies that will benefit from the results of the project and what the direct benefits are.**

In general, the beneficiaries of this project include the scientific, educational, service agencies and administrations. To exemplify the benefits with the management of a marine park, if an administration plans to (1) manage a coastal area, or (2) promote ecotourism of a marine park in a remote region, and if it is more cost-effective to use satellite images to monitor the natural and artificial changes, then this administration may take the following steps to benefit from this project: (1) the potential user drafts a short **proposal** on the planned use of **FORMOSAT-2** images (Appendix 1 & 2); (2) the Steering Committee shall **review** these proposals based on their merits to APEC/MRCWG; (3) the approved proposal shall be transmitted to the project contractor to arrange **imaging** by FORMOSAT-2; (4) satellite images will be delivered to the user for analysis, **free** of charge; (5) the user has full right in **non-commercial use** of the images; (6) possible usages of the image include designing and **promoting ecotourism** programs, planning new development, monitoring legal/illegal use of the park, promoting public awareness of the balance of economic development and marine resource conservation by providing satellite data to the general public and students for processing and analyzing satellite images on their own; (7) users who requested satellite images have the **obligation** to write a short report to document their analysis and send a copy of their reports to the Project Overseer as an outcome of this project.

The monitoring of the progress in processing and analyzing the satellite images depends mostly on personal pride. The recipients of satellite images are responsible to their Contact Person, because their requests of satellite images were through Contact Persons. We do have planned workshop and training sessions to help those participants who encounters some difficulties. For this multi-year project, the Steering Committee will certainly give higher priority in allocating satellite images to those member economies that progress well and produce reports accordingly.

- 5) **Describe the deliverables of the project and demonstrate how they will meet the needs of the targeted beneficiaries.**

The deliverables of the project includes

- (1) high-resolution images of FORMOSAT-2 satellites provided by Chinese Taipei,
 - (2) proceedings of capacity-building and brain-storming workshops for promoting knowledge-based economies,
 - (3) reports that demonstrate the usefulness of these satellite images in improving interaction among management, civil society, academics and business.
- All the images and reports shall be made available on the Internet by Chinese Taipei.

To exemplify that the **objectives are achievable**, we shall use the Planning of

Dongsha Marine National Park (**DMNP**). DMNP is consisted mostly an atoll that is 400 km from any major city. Planning of DMNP requires on-site surveys, mostly through diving by marine biologists. The advisory panel of DMNP considered that a tedious work for marine biologists and too slow a process for planning. The final plan was: applying satellite remote sensing technology to classify the atoll into different zones, then marine biologists will dive in each zone and collect their fauna and flora data, and the advisory panel will decide whether the zones may be open to the public, semi-open, or totally closed to the public. Follow-up programs will monitor any change of the marine ecosystem in DMNP before and after coastal constructions or tourist activities.

Every participant of this project may request free Formosat-2 satellite images of their coastal zones, apply the same technique in categorizing their marine ecosystem in a preliminary fashion, before any detailed on-sit survey that is very costly. This will greatly speed up the process of planning marine parks and other marine related activities, of assessing environmental impacts from human activities, and of raising the public awareness of the marine resource conservation.

Chinese Taipei has less costal zones than most member economies in APEC. We expect that the participants of this project will benefit from using satellite images more than Chinese Taipei did, and develop more creative application and commercial use of satellite images for their own marine resources.

As for a simple indicator of benefits, there is an indirect indicator – number of report of analyzed satellite image. To our experience, one usually spends 10% ~ 30% of project fund on purchasing satellite images, the rest will be on the analysis of satellite images, field surveys and cross-analysis, manpower, etc.. If this proposal is fully funded, then Chinese Taipei will provide Format-2 satellite images of coastal zones covering at least 23,000 km², if **20%** of these satellite images (or about 4,600 km²) were analyzed and reports were produced, then it means that the participating member economies have invested as much as APEC, or Chinese Taipei. Therefore,

$$I = (\text{APEC funding}) / (\text{analyzed satellite image with reports to APEC})$$

may serve as a simple indicator of benefits. A score of 10 means equal contribution from APEC, Chinese Taipei and participating member economies. $I > 10$ means more contribution from participating member economies.

- 6) **How the participation of the business/private sector and non-governmental institutions has been sought or will be sought. Illustrate how the business/private sector has been involved in the planning and delivery of the project and whether any other APEC fora have been consulted.**

Because the use of satellite images is initiated by the user for a certain economic purpose, this user may use the satellite image in the planning or bidding process that certainly involves the business/private sector.

To maximize the benefit of high resolution satellite data, Geographic Information System (GIS) technology is highly recommended. A company with expertise in GIS has agreed to assist training sessions on GIS if the workshop is held in Taipei.

Some of the participants may have no experience in processing satellite images, and therefore hinders a successful execution of this project. Our experience in the application of Formosat-2 satellite images and the participation of private business will ensure that all participants of this project can process the satellite images through standard procedures, and their knowledge of local marine environment provides site-specific interpretation of the satellite image. This will greatly reduce (or nearly remove) the risk of successfully executing this project.

7) **How this project will add “APEC value” (as to the potential benefits of implementing the projects) in the context of other work that might have been done elsewhere in the same field.**

This project adds “APEC value” because it has not been done elsewhere. It provides required commercially available satellite data for free. This project may be done elsewhere only if there is an agency willing to contribute such satellite data. In promoting knowledge-based economies and the spirit of cooperation in APEC, Chinese Taipei promises to contribute the required satellite data to this APEC project.

8) **An indication of how the project might contribute to related projects or activities in APEC or elsewhere.**

The 2-meter resolution images made by the FORMOSAT-2 satellite may be used in the planning, development, and monitoring of marine-related ecotourism and coastal development and management, in the management of near-shore mariculture industry, and in the promotion and monitoring of marine parks in remote areas. Chinese Taipei shall contribute images of the ROCSAT-2 satellite whose total value shall match the APEC funding of this project at the price of \$2 per square kilometer. All requests of satellite images shall be initiated by end users, and the priority of satellite coverage should be from the consensus of the Steering Committee that is composed of experts from co-sponsoring member economies and Chinese Taipei.

Conservation of marine resources is a national issue in most countries. Take coral reefs as an example. Most maritime agencies and experts in coral ecosystems are shy of using satellite data, because the initial investment in purchasing and interpreting satellite images is high. Through this project, they may acquire the free image first, then interpret the image qualitatively by themselves and search for experts for interpreting the satellite images quantitatively. Therefore, any MRC-related project may benefit from this project and a knowledge-based economy is built during the process of developing new technology.

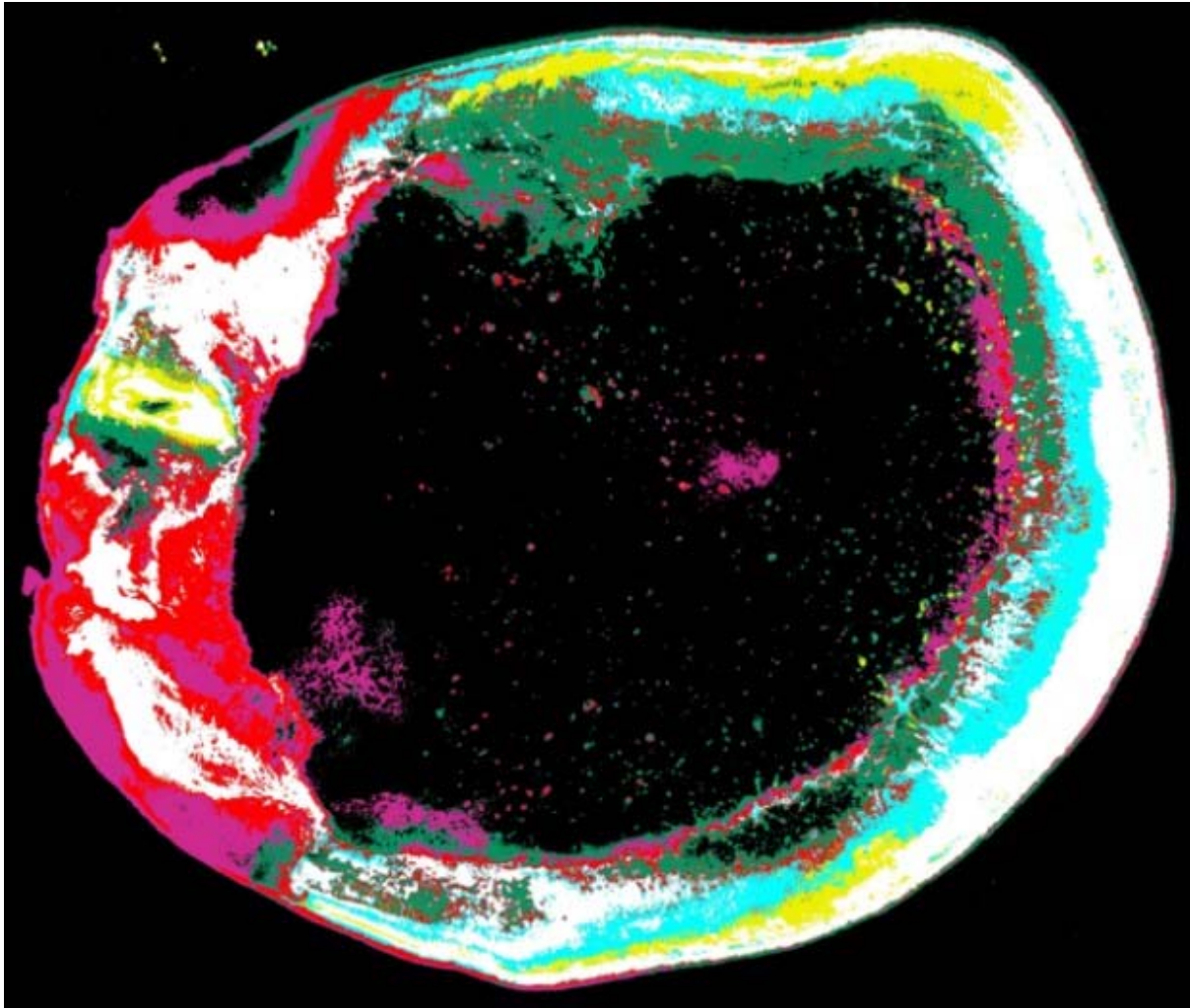
Methodology

- 9) **A concise description of the project's methodology by components, with its associated outputs clearly specified. (For a research project this may include the means and timescale for the collection and analysis of data and how this analysis will be disseminated; for a capacity building project it may include the preparation of the teaching materials and the dates of holding the courses and any provision for the compilation of a report; etc).**

There are three components in this project that are complementary to each other:

- (a) Application of satellite images:
Individual members of the steering committee are responsible in promoting the use of valuable satellite images and collectively they decide on the priority of proposals that meet the goal of this project;
Each approved proposal should provide a report of their application of the satellite image that promotes knowledge-based economies.
Workshops will be held on the technology of integrating satellite data, in situ observations, models and services.
- (b) Supply of satellite images:
Chinese Taipei will (1) organize the Steering Committee meetings routinely over the Internet for reviewing new proposals and the progress of this project, and (2) request the FORMOSAT-2 satellite to take the images at specified locations and times, as approved by the Steering Committee; (3) allow user to browse images and access original data.
- (c) Business sector:
Workshops will be held to present the result of analysis of the satellite images, exchange views and ideas in developing new technology. Private companies will be invited to present their capability in professional analysis of the satellite images, such as various imaging processing hardware/software, and GIS software for integrating satellite images with other data from ground surveys – e.g. bathymetry, type of sediment, type of land use, facilities (road, information center, recreation facilities, etc).

To exemplify the use of FORMOSAT-2 satellite image in the planning of ecotourism, we shall use our satellite images for the planning of a national marine park at Dongsha Atoll (116.8E, 20.8N).



In this false-color image, one can roughly divide the zones from the 15 m depth at the center (dark) to deep water outside the atoll (dark), in between are zones of scattered knolls (coral cluster inside the atoll), and a mixture of sand, sea grass, algae, and coral. This satellite image is useful for planning onsite surveys, allocation of conservation areas, and various types of recreation, etc.

- 10) **The number of APEC member economies that will participate in this project. Please indicate the names of member economies participating in each component of the project as set out in (9).**

Member economies that intend to participate are PR China; Hong Kong, China; Indonesia; Philippines; Russia; Chinese Taipei; Thailand; and Viet Nam; We expect their participation in the Steering Committee and the use of satellite images. Chinese Taipei will provide the requested satellite images at users' request.

The participation of business sectors shall mostly depend on the venue of the workshop and the seminar.

Dissemination of Project Output

- 11) A plan for the publication and dissemination of the results of the project, including:
 - (a) Reports from the users of satellite data
 - (b) Workshop proceedings
 - (c) The material that is provided by the private sectors who give seminars or training sessions
 - (d) Above reports and proceedings shall be available over the internet.

Gender Concerns

- 12) Show how the objectives of the project provide benefits for women, where appropriate. APEC Ministers have indicated (*Framework for the Integration of Women in APEC*) that benefits might include: increased involvement of women; taking account of the differences in women's and men's lives (gender analysis); and collection/use of sex-disaggregated data.

The proposed work is mostly in-lab studies of satellite images rather than field work. Participation of women will be encouraged because this project is not labor intensive, but brain-intensive work for promoting knowledge-based economies.

- 13) Show how the participation of women has been/will be sought. Show how women are involved in the planning, management, allocation of resources, and implementation of the project.

Chinese Taipei will ensure the participation of women in the Steering Committee, which has the full power in allocating resources – the satellite images.

- 14) Provide a brief description of the way women will be able to participate equitably in the development and implementation of the project.

Because all decisions come out of consensus, women's participation on the Steering Committee will automatically insure that women's views will be fully honored.

- 15) Provide a brief description to show that the project will collect and use sex-disaggregated data (if available) to measure the project's effects on women.

N.A.

- 16) Does the plan for the publication and dissemination of the project's results include communication methods that are appropriate for women? Questions that may be relevant include: Are women one of the target audiences? Does the plan take account of women with low literacy and women with low access to electronic media? Will the results be disseminated to women's organizations?

The publication and dissemination of the project's results are appropriate to both women and men. Publications resulting from this project are primarily in 3 formats: hardcopy, web page, and CD. Most readers can download the proceedings through the SAKE web page. Anyone with only slow access to electronic media may write to the Project Overseer or contractors and ask for a CD copy of publications.

- 17) Where appropriate, provide details of the project's budget that are allocated to activities that address the specific needs of women.

N.A.

- 18) Provide details of how the project proponent will assess whether he/she has met the gender criteria for APEC projects and how he/she will measure the impact of the project on women.

We shall encourage participating APEC economies to include female delegates to join this project and participating business sectors to assign their female employees to lecture in the workshops of this project.

Budget

- 19) An itemized budget for the project in the prescribed format. Applications under the Operational Account should use the format at Annex A1. The budget should illustrate the assumptions adopted (e.g. unit costs) for the computations.

	Total	APEC	Chinese Taipei	Other Players
1. Steering Committee meeting to review and plan SAKE project activities (2nd quarter of 2006)				
Experts/consultants' travel expenses, airfare @900 *6	5,400	2,700	1800	900
Per diem @180/day * 4.5 days *6	4,860	2,430	1620	810
Speaker honorarium / researcher fee	3,200	1,600	1,600	
Secretarial support (120 hr @ \$15/hr), including administrative work and typesetting reports	2,900	1,200	1,200	600
Publication of reports (125 copies)	1,500	500	1000	
Photocopying	200	200		
Communication (phone/fax/e-mail/mail/courier)	1,000	500	500	
Sub-total	19,160	9,130	7,720	2,310
2. Workshop on the analysis and application of high-resolution satellite data (4th quarter of 2006)				
Experts/consultants' travel expenses, airfare @900 *6	5,400	2,700	1800	900
Per diem @180/day * 4.5 days *6	4,860	2,430	1620	810
Consultant fee for organizing workshop and providing workshop data	11,600	6,000	4,000	1600
Computer specialist (SE)	9,000		9,000	
Speakers' honorarium	2,000	2000		
Secretarial support (160 hr @ \$15/hr), including administrative work, typesetting reports, update SAKE web page	7,200	2,400	2,400	2,400
Publication of reports (125 copies)	4,000	2,500	1,500	
Photocopying	1,600	1000	300	300
Communication (phone/fax/e-mail/mail/courier)	1,000	500	500	
Misc. expenses (hardware and software for maintaining the joint satellite station, local transportation, mtg room charge, etc.)	4,000		2,500	1,500
Sub-total	49,660	19,530	22,620	7,510
3. Workshop on integration of satellite and ground observation in the coastal zone (3rd quarter of 2006)				
Travel expenses of experts and consultants				
Airfare @900 *6	5,400	2,700	1800	900
Per diem @180/day * 4.5 days *6	4,860	2,430	1620	810
Speakers' honorarium	2,000	2000		
Consultant / researcher fee	8,000	3,200	3,200	1600
Secretarial support (120 hr @ \$15/hr), including administrative work and typesetting reports	6,600	2,400	2,400	1,800
Publication of reports (125 copies)	4,000	2,500	1,500	
Photocopying	1,600	1000	300	300
Communication (phone/fax/e-mail/mail/courier)	1,000	500	500	

Misc. expenses (local transportation, mtg room charge, etc.)	1,500	1,000	500
Sub-total	34,960	16,730	12,320
4. Purchase of satellite images	45,390	45,390	
Total (US\$)	150,170	45,390	89,050
	Total	APEC	Chinese Sponsor Taipei m. e..

20) **A timetable for the drawdown of APEC funding requested for the project, including details of any advance payment or installment payment requested and justifications for such requests.**

For organizing the Steering Committee meetings (around 2006 April) and the Workshops (3rd & 4th quarter of 2006), about 20% reimbursement per quarter and about 20% for final disbursement. The timetable for the drawdown of APEC funding is:

2006 April	\$ 5,000	Steering Committee meeting
2006 September	\$10,000	Workshops on the acquisition, exchange and application of satellite data
2006 October	\$10,000	Workshop on operational wave models and verification
2006 October	\$10,000	Workshop on ocean circulation models and their application to marine disasters
2007 June	\$10,390	Final disbursement at the completion of all project reports

21) **Details of any request for waiver or exception from the normal APEC financial rules with justifications.**

Participants of the SAKE project will include government officials. Waiver is requested for sponsoring government officials to attend SAKE meetings and workshops and where necessary obtain funding support from the project funding for airfare and per diems.

22)

Assessment of Project

With reference to your objectives stated in paragraph 1, provide detailed criteria (quantitative and qualitative) for how you will measure your results in the short and long term to know if your project has been successful. State your current benchmarks for measurement, your target results from the project for each measurement criterion and the range of acceptable results both in numerical and percentage terms, where possible.

Promotion of a knowledge-based economy requires novel data and the knowledge to use it. In this project, novel data shall be contributed by Chinese Taipei, and the knowledge shall come from the contractors, the experts from co-sponsoring member economies, and from the business sector.

The contractors have over 25 years experience in satellite oceanography and coastal studies. They shall assist the Project Overseer to acquire the needed satellite and in situ data for the success of this project.

The experts of co-sponsoring member economies are most knowledgeable people on their countries' needs for satellite data in promoting knowledge-based economies. They form the Steering Committee of this project. The request of satellite data shall be initiated from the users, and the approval by the Steering Committee shall be honored by Chinese Taipei in directing the satellite to take the requested images.

Experts in the academic community and in the business sectors will be invited to help the analysis of these satellite images, in order to make better use of the satellite images, and to link directly with economies.

(a) Expected Participants of SAKE Steering Committees and Workshops:

Based on past experience in the OMISAR project, we expect participants from Australia, Canada; People's Republic of China; Hong Kong, China; Indonesia; Korea; Malaysia, Peru; Philippines; Russia, Singapore; Chinese Taipei; Thailand; USA and Vietnam;

(b) Organizers of SAKE Workshops are major contributors to the SAKE Workshops, because most funding for SAKE is from participating scientists, institutions, or government agencies. Organizers are likely to come from People's Republic of China; Hong Kong, China; Singapore; Chinese Taipei; Thailand and Vietnam;

(c) Publications of the SAKE project are in the following formats:

Hardcopy with original files in CD format for presenting colored figures and images. They are freely available to all member economies. In most cases, 5 or more copies will be sent to Contact Persons of each member economy, and most proceedings are downloadable from the website:

<http://sol.oc.ntu.edu.tw/sake>

Annex A1**APEC Operational Account
Itemized Budget for Financial Year 2006**

Items			APEC Funding (USD)	Self Financing (USD)
<i>Direct Labour (1 Steering Committee meeting, 2 workshops)</i>	No. of Hours	Unit Rate (USD)		
- Honorarium, Consultant (including Researcher) Fees	670	\$40	14,800	12,000
- Consultant's Secretary Cost	1120	\$15	6,000	10,800
<i>Computer Specialist</i>	5 months	\$1800	0	\$9,000
<i>Travel</i>				
- Per Diem (including accommodation and "additional payment")	81 days	180	7290	7290
- Airfare	18 People	900	8100	8100
	No. of Copies	Unit cost (USD)		
<i>Publication of 3 proceedings (including distribution)</i>	30	50	\$500	\$1,000
	125	32	\$2,500	\$1,500
	125	32	\$2,500	\$1,500
<i>Photocopying (1 Steering Committee meeting, 3 workshops)</i>	34,000	0.1	\$2,200	\$1,200
<i>Communications (Phone/ Fax/ Mail/ Courier)</i>			\$1,500	\$1,500
<i>Miscellaneous</i>				\$7,000
<i>Satellite data</i>				\$45,390
<i>Total</i>			\$45,390	\$106,280

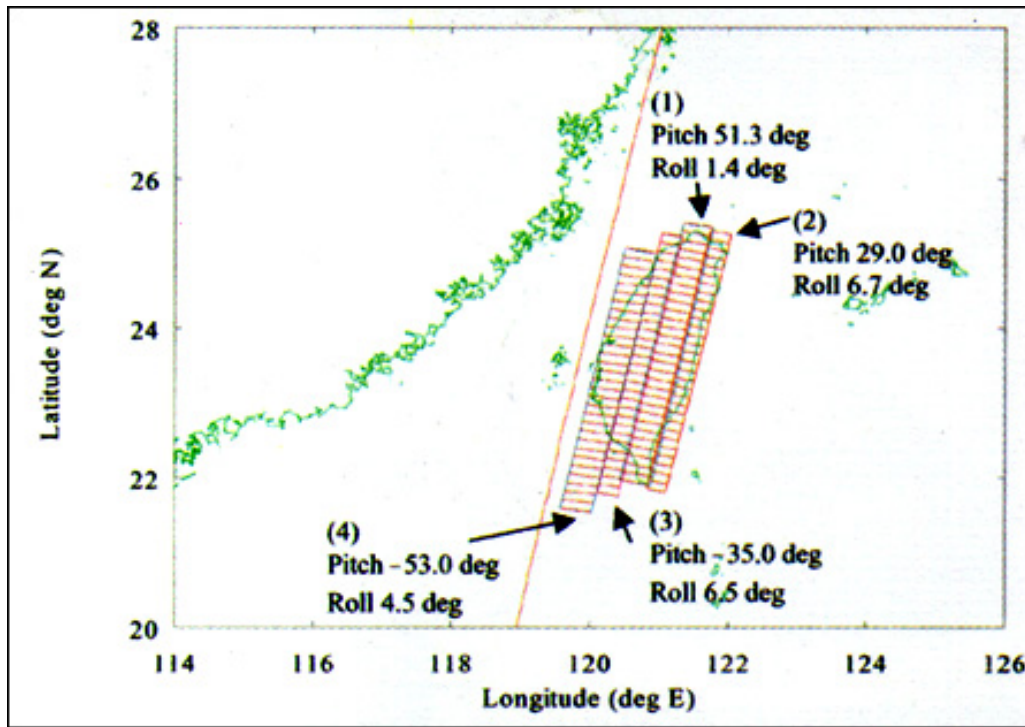
Appendix 1: Formosat-2 Remote Sensing Payload Specification

Formosat-2 is a scientific satellite for land and coastal applications. The specification of its CCD camera is listed in the table, with simulated images and method of imaging Taiwan are shown in the following figures. As one can see from the figure, Formosat-2 has a unique capability: taking 2 m resolution image of Taiwan Island in a single pass everyday. There is no other satellite can do the same.

orbit	891 km altitude, sun synchronous, passing Taiwan Strait twice daily
Panchromatic (PAN)	0.45~0.90 μ m
Multispectral (MS)	0.45~0.52 μ m (blue) 0.52~0.60 μ m (green) 0.63~0.69 μ m (red) 0.76~0.90 μ m (near IR)
Ground resolution	PAN (b/w) image 2 meter MS (color) image 8 meter
Bit depth	12
Swath of image	24 km or more
Mission life span	5 years
Date of launch	2004/5/21 Taipei time



Simulated images of FORMOSAT-2, Left: MS image, Right: PAN image



Imaging Taiwan Island in one satellite pass. It is done by changing the pitch and roll of the mirror of camera.

Comparison to **IKONOS** Sensors

- An 11 bit panchromatic sensor of 0.45 - 0.90 microns with 1 m ground resolution
- An 11 bit multispectral sensor which collects 4 bands of data in the following spectral bands with 4 m ground resolution;
- Band 1 - 0.445 - 0.516 microns - red
- Band 2 - 0.506 - 0.595 microns - green
- Band 3 - 0.632 - 0.698 microns - blue
- Band 4 - 0.757 - 0.853 microns - near infrared

Comparison to **Quickbird**:

LAUNCH October 18, 2001, Vandenberg Air Force Base, California

ORBIT 450 km altitude; 93.5 minute orbit time; 10:30 am equator crossing time (descending);

inclination 97.2° sun-synchronous

NOMINAL SWATH WIDTH 16.5 km at nadir

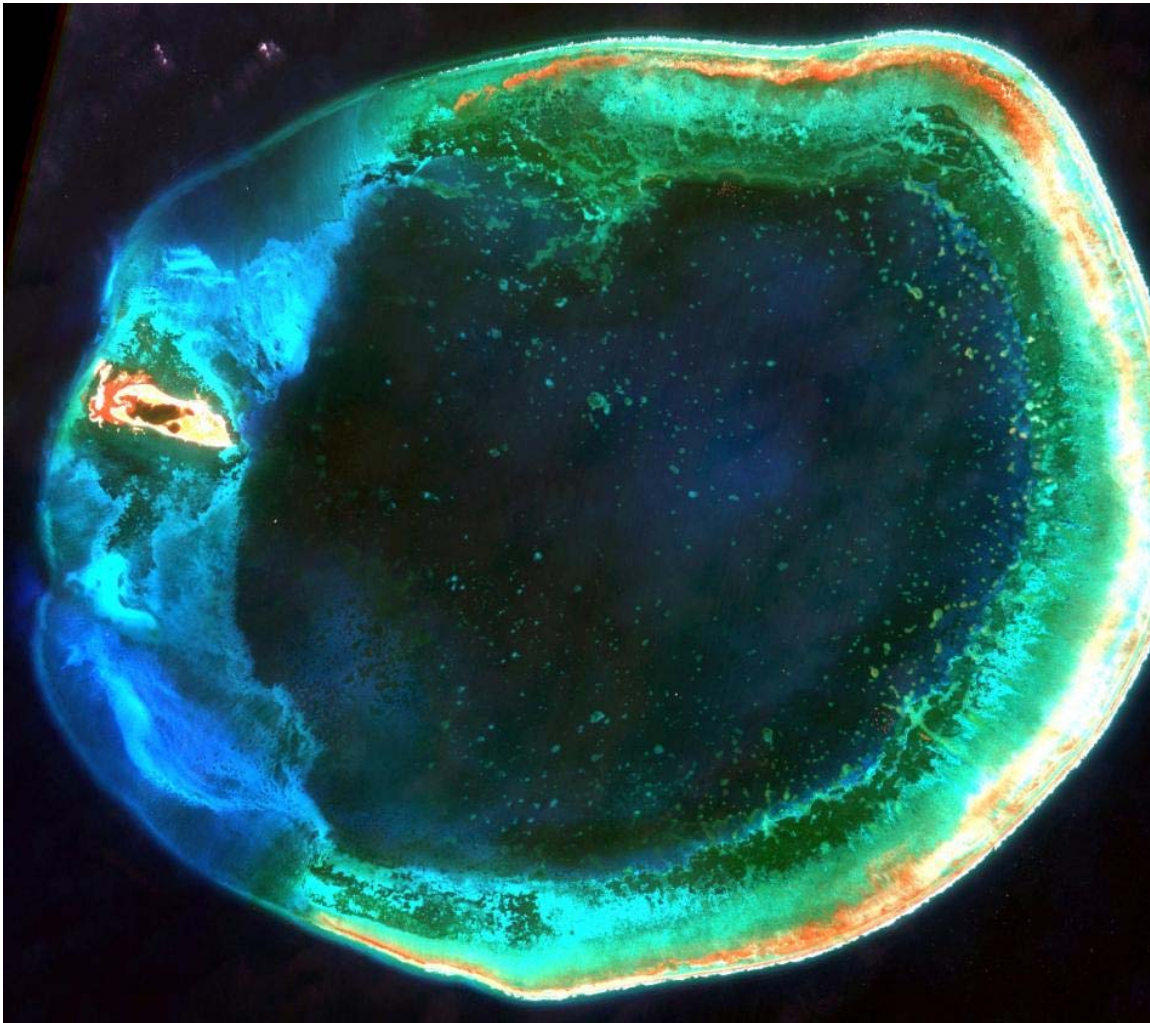
ON-BOARD STORAGE 128 Gbit (approximately 57 scenes)

DYNAMIC RANGE 11 bits per pixel

RESOLUTION	PANCHROMATIC RESOLUTION <i>Basic:</i> 0.61 metres at nadir, 0.72 metres at 25° off-nadir nadir <i>Standard & Orthorectified:</i> resampled to 0.6 / 0.7 metre GSD	MULTI-SPECTRAL <i>Basic:</i> 2.44 metres at nadir, 2.88 metres 25° off-nadir <i>Standard & Orthorectified:</i> resampled to 2.4 / 2.8 metre GSD
SPECTRAL BANDWIDTH	450~900 nanometers	<i>Blue:</i> 450~520 nanometers <i>Green:</i> 520~600 nanometers <i>Red:</i> 630~690 nanometers <i>Near-IR:</i> 760~900 nanometers

Appendix 2: Formosat-2 Image of Dongsha Atoll

Dongsha Atoll is located southwest of (21N, 117E). It is composed of Dongsha Island at the west, coral reef around a shallow lagoon of maximal 15 m depth and diameter about 25 km. Many knolls (blue and green dots in the image) scatter in the lagoon. Dongsha Atoll is designated as National Marine Park. Marine resources like coral and tropical fishes were severely damaged due to heavy, illegal exploitation in the past. Land and ocean surveys are carried out for the recovery of marine ecosystem and for the public use of the marine park.



Appendix 3: Price of high resolution satellite images

The price of high resolution satellite images varies with their ground resolution, image quality (bit depth), level of post processing, etc. The following is an example of 1-m resolution IKONOS image that is available on the web page of Radarsat International.

Radarsat International (Rev. Date: 09/02/04)

IKONOS Imagery Product Price List (per sqkm, \$US)

Imagery	Spectral Resolution	U.S., Mexico	Canada	South America	Japan	Australia & New Zealand
Geo Programmable 15m CE90	B&W	18.00	18.00	18.00	44.00	18.00
	MS	18.00	18.00	15.00	44.00	18.00
	Color	19.80	19.80	19.80	56.00	19.80
	Bundle	25.20	25.20	27.00	88.00	25.20

The pricing of Quickbird (0.6 m ground resolution) may be found at http://www.hgiis.com/documents/en/PriceList_04-01-2005_en.pdf

Formosat-2 images have similar bands like IKONOS and Quickbird satellite, but with pixel sizes about twice of IKONOS and 3 times of Quickbird. It means that for the same 1 km square, Formosat-2 has only about 1/4 of number of pixels than IKONOS, and 1/10 of that of Quickbird. Since Quickbird is priced at about 2~3 times of IKONOS, Formosat-2 should be priced at about 1/3 of IKONOS images.

If Formosat-2 data are processed to the same level like IKONOS data, then Formosat-2 data will be worth about US\$4.5~US\$11 per kilometer squared. In this proposal, we expect the users of Formosat-2 data to do the fine tuning of the satellite images that requires local DEM (Digital Elevation Model) for hills, but not for the ocean or flat areas. **Our Formosat-2 images are rated at US\$2 per square kilometer.** It means that if APEC approves the requested budget (about US\$46,000), then Chinese Taipei will provide Formosat-2 images that cover at least 23,000 square kilometer in total for developing knowledge-based economies on marine resources.

Archived data is priced at about 40% of the cost of requested data, but it is not applicable to this proposal. Because all Formosat-2 images are taken according to requests of the participants (the users) of this project SAKE, there is no archived data to distribute.