

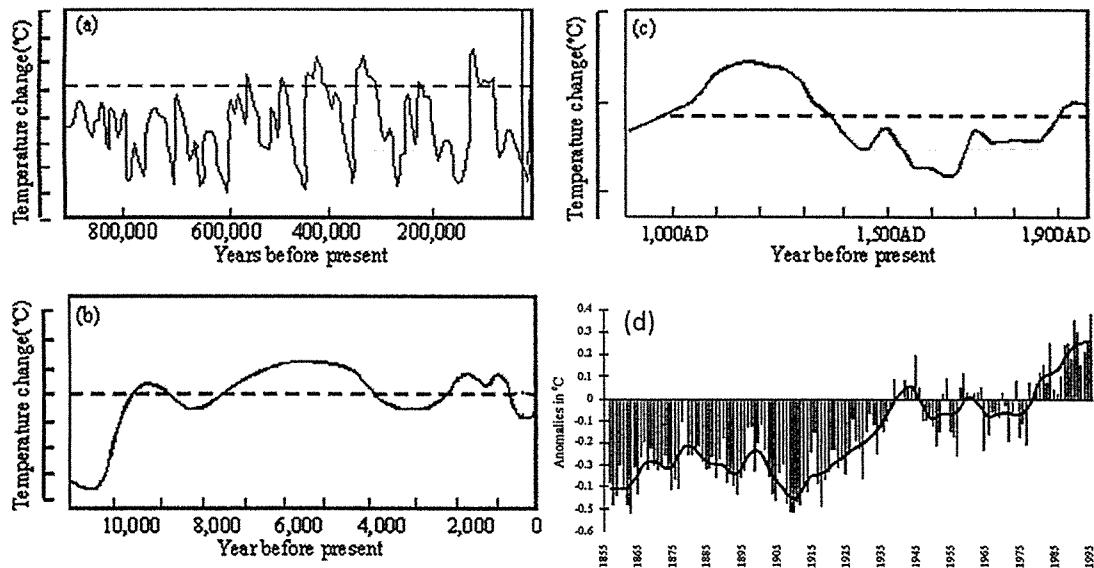
第一題 (兩小題佔總分 50%)

2016 年 1 月，北半球亞洲東岸以及美國東岸分別出現一波近幾年來極罕見的低溫極端天氣現象。

1. 請就地球系統科學的角度，說明這一波寒流的形成機制？並且在說明這次個案與一般冬季寒流天氣個案有何不同 (25%)?
2. 這一波寒流所造成哪些台灣社會衝擊？中央政府與各不同縣市政府的因應之道又有哪些值得嘉許或改善之處？(25%)

第二題 (25%)

下圖(a)~(c)分別是過去百萬年、過去 1 萬年、過去 1 千年 (摘自 Folland *et al.*, 1990 和(d)過去 1 百年(1855~1995, 摘自 WMO, 1996)四種時間尺度的全球平均氣溫變動。請你就這些資訊說明全球氣溫變遷特徵，以及我們如何分辨人為與自然的全球暖化特徵？如果無法判斷，那再需要哪些資訊佐證？



第三題 (25%)

2015 年底，巴黎氣候變遷高峰會順利結束。聯合國氣候變遷框架協議小組 (United Nations Framework Convention on Climate Change UNFCCC)，在其網站上發表相關新聞稿(如第 2~4 頁內容)。請你就這一國際議題，提出台灣理當需要如何回應？以及回應時又會遇到哪些現實挑戰 (包括國際與國內兩面向)？

見背面

摘自 <http://newsroom.unfccc.int/unfccc-newsroom/finale-cop21/>

Historic Paris Agreement on Climate Change
195 Nations Set Path to Keep Temperature Rise Well Below 2 Degrees Celsius
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Paris, 12 December 2015 - An historic agreement to combat climate change and unleash actions and investment towards a low carbon, resilient and sustainable future was agreed by 195 nations in Paris today.

The Paris Agreement for the first time brings all nations into a common cause based on their historic, current and future responsibilities. The universal agreement's main aim is to keep a global temperature rise this century well below 2 degrees Celsius and to drive efforts to limit the temperature increase even further to 1.5 degrees Celsius above pre-industrial levels. The 1.5 degree Celsius limit is a significantly safer defense line against the worst impacts of a changing climate. Additionally, the agreement aims to strengthen the ability to deal with the impacts of climate change.

To reach these ambitious and important goals, appropriate financial flows will be put in place, thus making stronger action by developing countries and the most vulnerable possible, in line with their own national objectives. "The Paris Agreement allows each delegation and group of countries to go back home with their heads held high. Our collective effort is worth more than the sum of our individual effort. Our responsibility to history is immense" said Laurent Fabius, President of the COP 21 UN Climate change conference and French Foreign Minister. The minister, his emotion showing as delegates started to rise to their feet, brought the final gavel down on the agreement to open and sustained acclamation across the plenary hall. French President Francois Hollande told the assembled delegates: "You've done it, reached an ambitious agreement, a binding agreement, a universal agreement. Never will I be able to express more gratitude to a conference. You can be proud to stand before your children and grandchildren."

UN Secretary General Ban Ki-moon said: "We have entered a new era of global cooperation on one of the most complex issues ever to confront humanity. For the first time, every country in the world has pledged to curb emissions, strengthen resilience and join in common cause to take common climate action. This is a resounding success for multilateralism." Christiana Figueres, Executive Secretary of the UN Framework Convention on Climate Change (UNFCCC), said: "One planet, one chance to get it right and we did it in Paris. We have made history together. It is an agreement of conviction. It is an agreement of solidarity with the most vulnerable. It is an agreement of long-term vision, for we have to turn this agreement into an engine of safe growth." "Successive generations will, I am sure, mark the 12 December 2015 as a date when cooperation, vision, responsibility, a shared humanity and a care for our world took centre stage," she said. "I would like to acknowledge the determination, diplomacy and effort that the Government of France have injected into this remarkable moment and the governments that have supported our shared ambition since COP 17 in Durban, South Africa," she said.

Agreement Captures Essential Elements to Drive Action Forward

The Paris Agreement and the outcomes of the UN climate conference (COP21) cover all the crucial areas identified as essential for a landmark conclusion:

- Mitigation – reducing emissions fast enough to achieve the temperature goal
 - A transparency system and global stock-take – accounting for climate action
 - Adaptation – strengthening ability of countries to deal with climate impacts
 - Loss and damage – strengthening ability to recover from climate impacts
 - Support – including finance, for nations to build clean, resilient futures
- As well as setting a long-term direction, countries will peak their emissions as soon as possible and continue to submit national climate action plans that detail their future objectives to address climate change.

This builds on the momentum of the unprecedented effort which has so far seen 188 countries contribute climate action plans to the new agreement, which will dramatically slow the pace of

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global greenhouse gas emissions. The new agreement also establishes the principle that future national plans will be no less ambitious than existing ones, which means these 188 climate action plans provide a firm floor and foundation for higher ambition.

Countries will submit updated climate plans – called nationally determined contributions (NDCs) – every five years, thereby steadily increasing their ambition in the long-term. Climate action will also be taken forward in the period before 2020. Countries will continue to engage in a process on mitigation opportunities and will put added focus on adaptation opportunities. Additionally, they will work to define a clear roadmap on ratcheting up climate finance to USD 100 billion by 2020. This is further underlined by the agreement’s robust transparency and accounting system, which will provide clarity on countries’ implementation efforts, with flexibility for countries’ differing capabilities.

“The Paris Agreement also sends a powerful signal to the many thousands of cities, regions, businesses and citizens across the world already committed to climate action that their vision of a low-carbon, resilient future is now the chosen course for humanity this century,” said Ms Figueres.

Agreement Strengthens Support to Developing Nations

The Paris Agreement underwrites adequate support to developing nations and establishes a global goal to significantly strengthen adaptation to climate change through support and international cooperation.

The already broad and ambitious efforts of developing countries to build their own clean, climate-resilient futures will be supported by scaled-up finance from developed countries and voluntary contributions from other countries. Governments decided that they will work to define a clear roadmap on ratcheting up climate finance to USD 100 billion by 2020 while also before 2025 setting a new goal on the provision of finance from the USD 100 billion floor. Ms. Figueres said. “We have seen unparalleled announcements of financial support for both mitigation and adaptation from a multitude of sources both before and during the COP. Under the Paris Agreement, the provision of finance from multiple sources will clearly be taken to a new level, which is of critical importance to the most vulnerable.” International cooperation on climate-safe technologies and building capacity in the developing world to address climate change are also significantly strengthened under the new agreement.

Signing the Paris Agreement

Following the adoption of the Paris Agreement by the COP (Conference of the Parties), it will be deposited at the UN in New York and be opened for one year for signature on 22 April 2016--Mother Earth Day. The agreement will enter into force after 55 countries that account for at least 55% of global emissions have deposited their instruments of ratification.

Cities and Provinces to Companies and Investors Aligning

Today’s landmark agreement was reached against the backdrop of a remarkable groundswell of climate action by cities and regions, business and civil society. During the week of events under the Lima to Paris Action Agenda (LPAA) at the COP, the groundswell of action by these stakeholders successfully demonstrated the powerful and irreversible course of existing climate action. Countries at COP 21 recognised the enormous importance of these initiatives, calling for the continuation and scaling up of these actions which are entered on the UN-hosted NAZCA portal as an essential part in the rapid implementation of the Paris Agreement.

The scale of the Action Agenda globally is unprecedented, part of which is captured through Nazca and the LPAA:

- Over 7,000 cities, including the most vulnerable to climate change, from over 100 countries with a combined population with one and a quarter billion people and around 32% of global GDP.
- Sub-national states and regions comprising one fifth of total global land area and combined GDP of \$12.5 trillion.
- Over 5,000 companies from more than 90 countries that together represent the majority of global market capitalisation and over \$38 trillion in revenue.

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- Nearly 500 investors with total assets under management of over \$25 trillion
Christiana Figueres said: “The recognition of actions by businesses, investors, cities and regions is one of the key outcomes of COP 21. Together with the LPAA, the groundswell of action shows that the world is on an inevitable path toward a properly sustainable, low-carbon world.”

More Details on the Paris Agreement

- All countries will submit adaptation communications, in which they may detail their adaptation priorities, support needs and plans. Developing countries will receive increased support for adaptation actions and the adequacy of this support will be assessed.
- The existing Warsaw International Mechanism on Loss and Damage will be significantly strengthened.
- The agreement includes a robust transparency framework for both action and support. The framework will provide clarity on countries’ mitigation and adaptation actions, as well as the provision of support. At the same time, it recognizes that Least Developed Countries and Small Island Developing States have special circumstances.
- The agreement includes a global stocktake starting in 2023 to assess the collective progress towards the goals of the agreement. The stocktake will be done every five years.
- The agreement includes a compliance mechanism, overseen by a committee of experts that operates in a non-punitive way.

The COP also closed on a number of technical issues.

- Under the Kyoto Protocol, there is now a clear and transparent accounting method for carry-over credits for the second commitment period, creating a clear set of rules.
- The first round of international assessment and review process (IAR) that was launched in 2014 was successfully completed.
- A number of technical and implementation issues related to the existing arrangements on technology, adaptation, action for climate empowerment and capacity building were also successfully concluded.

About the UNFCCC

With 196 Parties, the United Nations Framework Convention on Climate Change (UNFCCC) has near universal membership and is the parent treaty of the 1997 Kyoto Protocol. The Kyoto Protocol has been ratified by 192 of the UNFCCC Parties. For the first commitment period of the Kyoto Protocol, 37 States, consisting of highly industrialized countries and countries undergoing the process of transition to a market economy, have legally binding emission limitation and reduction commitments. In Doha in 2012, the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol adopted an amendment to the Kyoto Protocol, which establishes the second commitment period under the Protocol. The ultimate objective of both treaties is to stabilize greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system.

See also: <http://unfccc.int>

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UNFCCC Executive Secretary Christiana Figueres on Twitter: @CFigueres.

UNFCCC on Facebook: [facebook.com/UNclimatechange](https://www.facebook.com/UNclimatechange)

Visualization of social media at COP21: <https://climatetalkslive.org/>

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