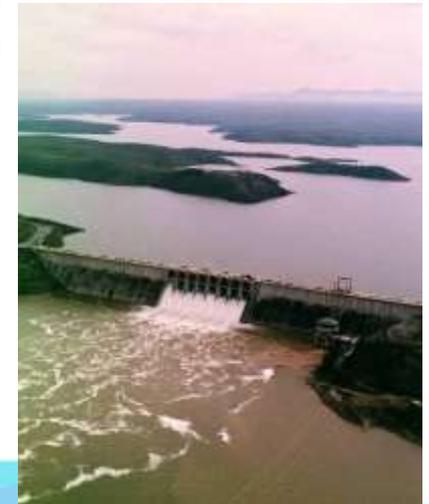




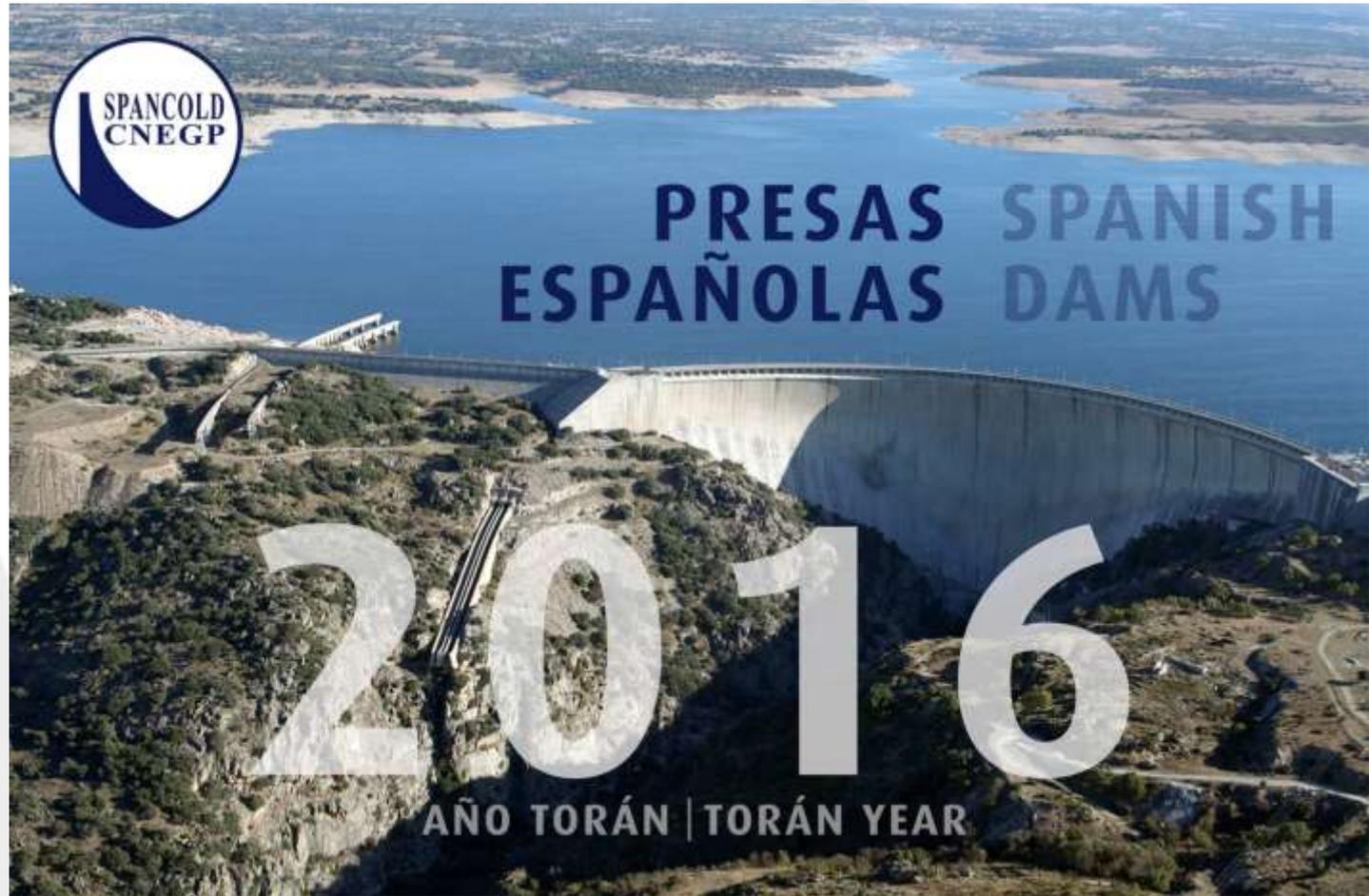
LAS PRESAS EN ESPAÑA

JOSÉ POLIMÓN, 29 DE NOVIEMBRE DE 2016





2016 AÑO TORÁN





JOSÉ TORÁN





JOSÉ TORÁN





JOSÉ TORÁN





JOSÉ TORÁN





JOSÉ TORÁN



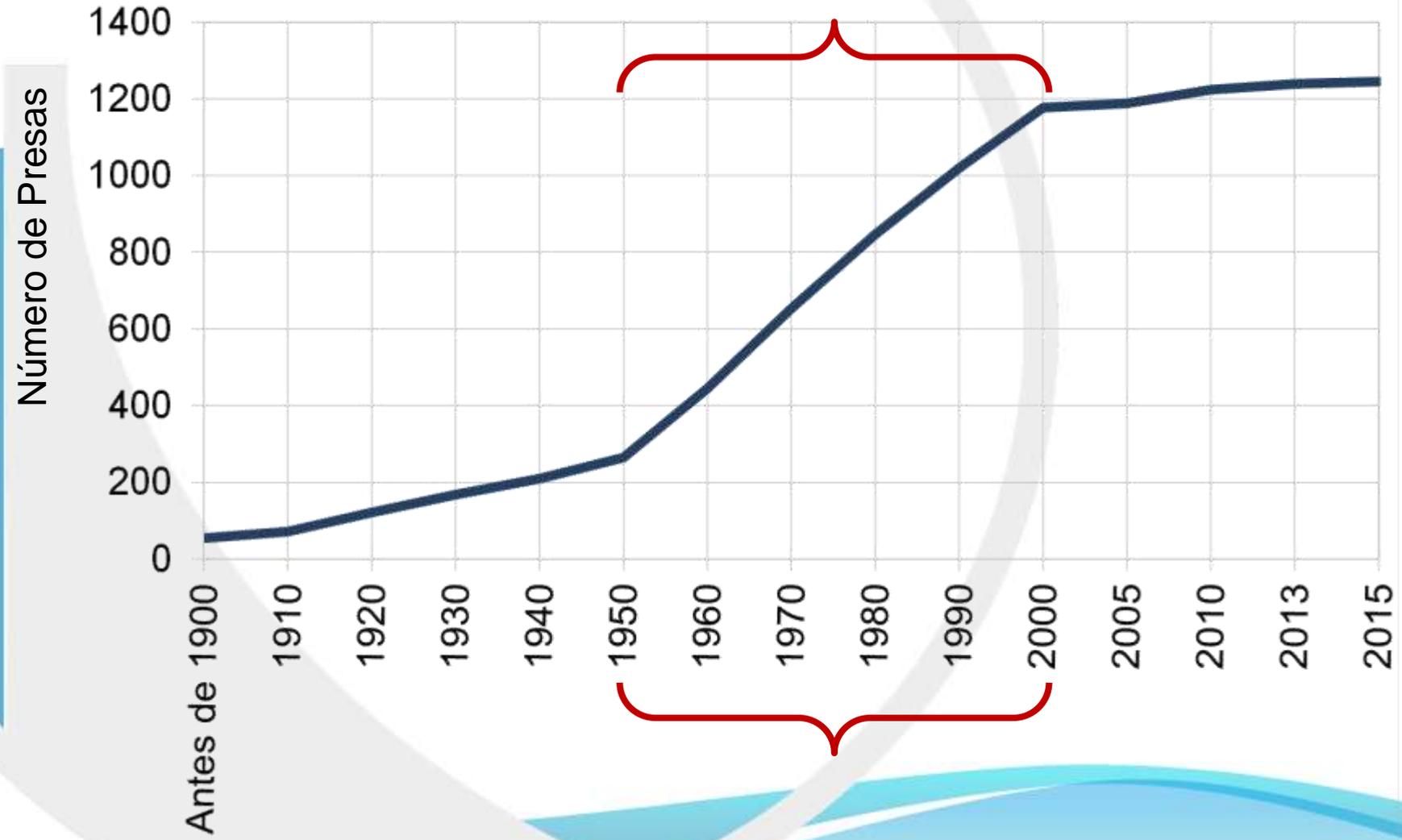


CONGRESO ICOLD. MADRID 1973





NÚMERO DE PRESAS: 1.230 17 EN CONSTRUCCIÓN





INGENIEROS HIDRÁULICOS SIGLO XX

- INTERNACIONAL: TORÁN, PEREA, HERRERAS,
- MOP: MENDILUCE, FDEZ CASADO, ALONSO FRANCO
- ID: GALÍNDEZ, M. ARTOLA, GUINEA
- HE: CASTILLO, NAVALÓN, ESCUDERO, VILLA
- SIL: TRINCADO, CASTRO, DEL CAMPO, PEIRONCELY
- FENOSA: YORDI, DEL HOYO,
- INI: VALLARINO, GUITART, ÁLVAREZ, BAZTÁN,
- SUR: BRAVO, PALANCAR,
- VIESGO: PRESMANES, TELLERÍA,
- HC: COLMENERO, DÍAZ-CANEJA, P. GUERRERO
- CONSULPRESA: SERAFIM, PEREIRA,



PRESA DE CANELLES





PRESA DE ALDEADÁVILA





PRESA DE LAS PORTAS





PRESA DE ALCÁNTARA JOSÉ MARÍA ORIOL





PRESA DE ALMENDRA





PRESA DE IZNAJAR





PRESA DE CUEVAS DE ALMANZORA





PRESA DE CHANZA



PRESA DE JOSÉ TORÁN





PRESA DE LA BREÑA





PRESA DE ENCISO





PRESA DE CASTROVIDO (en construcción)





Nº DE GRANDES PRESAS. AÑO 2016 ($h > 15$ m, $V > 3$ hm³)

	PAIS	Nº PRESAS
1	China	23.842
2	USA	9.265
3	India	5.102
4	Japón	3.108
5	Brasil	1.392
6	Corea (Rep.)	1.306
7	Canadá	1.170
8	Sudáfrica	1.114
9	España	1.082 (1.230)

FUENTE: ICOLD Register of Dams 2016/SPANCOLD



PRESAS EXISTENTES. RETOS

- **EDAD**
- **SEDIMENTACIÓN**
- **GESTIÓN SOSTENIBLE**
- **CONSERVACIÓN & MANTENIMIENTO**
 - **SEGURIDAD**
 - **OPERACIÓN**
 - **AVENIDAS**
 - **SEQUÍAS**



GARANTÍA SEGURIDAD HÍDRICA

- CAMBIO CLIMÁTICO: ADAPTACIÓN Y MITIGACIÓN.**
- REVISAR PLANES SEQUÍA&INUNDACIONES**
- FINANCIAR MANTENIM, CONSERVACIÓN Y OPERACIÓN DE ≈ 1.300 PRESAS Y EMBALSES**
- PRIORIZAR INVERSIONES PARA MEJORAR RESILIENCIA A LA VARIABILIDAD HIDROLÓGICA**
- ASEGURAR SEGUIMIENTO DE ACCIONES Y PROGRAMAS DE LOS PLANES**



DROUGHT





EBRO RIVER (SPAIN) MARCH 2015



JAVIER BELVER / EF



OPTIMIZAR AGUA - ENERGÍA

- **COORDINAR PLANIFICACIÓN Y GESTIÓN DE AGUA Y ENERGÍA**
- **ALMACENAMIENTO DE AGUA Y ENERGÍA: CENTRALES REVERSIBLES**
- **EFICIENCIA ENERGÉTICA COMO CRITERIO DE PROYECTO Y OPERACIÓN PARA GARANTIZAR SOSTENIBILIDAD**
- **ESTABLECER ESTRATEGIA Y PLAN DE ACCIONES A CORTO Y MEDIO PLAZO**



I+D+I, CONOCIMIENTO Y EDUCACIÓN

- **FORMACIÓN DE PERSONAL EN OPERACIÓN Y SEGURIDAD (MÁSTER SPANCOLD)**
- **RETECNIFICACIÓN ORGANISMOS GESTORES DEL AGUA (CENTRALES Y AUTONÓMICOS)**
- **REFORZAR PROYECTOS DENTRO DE LÍNEAS DE INNOVACIÓN PARA MEJORAR LA GESTIÓN DEL AGUA**
- **INFORMACIÓN AL PÚBLICO Y COMUNICACIÓN**

WORLD DECLARATION. KYOTO 2012

ICR 0018-01/Declaration-02-2012/12-13/15 Page 1

World declaration Water Storage for Sustainable Development



In 2050 world population will exceed nine billion inhabitants

The global demand for population, both rural and urban, and the socio-economic development with increasing living standards for all, will undoubtedly raise the requirements for water, food and energy consumption. Population will continue to increase in cities where the need for energy, food and energy will be more acute. The population growth and socio-economic development mean that by 2050:

The continuously increasing demands of water, food and energy will challenge the natural resources. We need to face this exceptional situation because at the same time:

- Due to climate change, water distribution may become more irregular, and droughts related to fresh water droughts will worsen.
- Energy sources are limited.
- Food shortages are predicted and energy production will decrease as oil reserves are limited. Freshwater energy is considered an industrial resource which, from the industrial and the capacity of nuclear energy has increased, is a finite resource.
- Natural resources such as wind and solar resources rapidly and should be developed to reach acceptable, however they must take up Hydrogen as a play the role, but policies and markets are not encouraging this.

Water is precious and water storage infrastructure will become increasingly important!

Water storage infrastructure, providing multiple water services, is vital for human development. Out of the 6000 km³ of freshwater available each year, only 1000 km³ are accessible. Through the construction of more than 10,000 km³ of water storage in 2000 countries, throughout the world over the past 1,200 years, many communities are able to enjoy reliable water services. These water storage facilities regulate about 60,000 km³ of water.

There is a need and interest in sustainable development has already been achieved in various declarations. World Forum on Sustainable Development (WFD), Beijing Declaration on Sustainable and Sustainable Development (WSD), World Declaration on Sustainable and Sustainable Development (WSD), World Declaration on Sustainable and Sustainable Development (WSD), World Declaration on Sustainable and Sustainable Development (WSD).

Humanity is facing a more severe water situation than it has ever faced in the past.

To face this century's greatest challenge - to manage water sustainably - we need to improve

- existing water systems and further develop new water storage infrastructure. This will require adequate legislation and funding. It must also include the optimization of the use of water by introducing multiple programs.
- Flood management and drought mitigation
- Irrigation for food production
- Energy production
- Drinking water and sanitation
- Industrial water supply
- Navigation
- Environmental services
- etc.

There is need to improve the maintenance and operation of existing water storage infrastructure.

Making the most of the aging assets, regional knowledge, and the effects of climate change. Some of a typical investment efforts to maintain the existing water storage infrastructure. For example, modern monitoring and engineering can improve the safety of concrete gravity dams, arch dams and Hook. Climate change is likely to make hydrological patterns change. Reservoir regulation will be important to meet more flexible needs considering the requirements of both upstream and downstream users. With the latest forecasting systems and real-time acquisition of data, dam operators can control water levels in complex ways which is the best solution for water infrastructure safety and the use of water resources.

There is need to accelerate the development of new water storage infrastructure for multiple purposes.

- **Food management and drought mitigation**
Floods and droughts are the greatest water management problem for many countries with insufficient water storage infrastructure. Every year more than 100 million people are affected by flood damage. For a climate change, flood and droughts will become more frequent and severe. Water storage infrastructure is a key component of such a disaster mitigation, especially in developing countries.
- **Irrigation for food production**
Irrigated agriculture covers about 177 million hectares, about 15% of the world's arable land. This sector also has remarkably more production, providing about 40% of the world's crop output. Irrigated lands also encourage agricultural employment, with nearly 30% of the world's food production made to be grown with long dry seasons. Since arable land area is limited, the

additional production will require efficient use of existing irrigation facilities and expanding the area under irrigation through increased water storage facilities. It is estimated that 60% of additional food production by 2031 will need to come from irrigated land.

■ **Energy production**
Hydroelectric supplies about 16% of the world's electricity today. Hydrop supplies more than 10% of national electricity in about 60 countries, more than 50% in 15 countries and about 80% of electricity in 13 countries. The flexibility of this renewable resource is fundamental to providing electricity services with demand responsiveness in development of other intermittent sources of electricity production such as solar and wind, which have less flexible. Consequently the energy stored in water, conventional thermal gas hydrogens and pumped storage, improves the reliability of power systems to a clear and efficient manner. Only 10% of the world's identified hydropower potential has been developed. Considering the outstanding hydropotential that still exists, water storage infrastructure of flood relief, water generation and generation, scientific and improve the management of water resources.

■ **Drinking water and sanitation**
Over 800 million people in the world do not have access to safe water for drinking, cooking and sanitation. With the rapid population growth, and without investment in water, the number of people who could not have access to safe water will reach 2 billion by 2025. One of the Millennium Development Goals is to halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation. Investments in sustainable water storage infrastructure in developing countries would help address this goal.

■ **Industrial water supply**
Every manufacturing process uses water during its production process. Industrial water use includes purposes such as processing, cooling, diluting, washing, or transporting a product as well as for activities such as office, manufacturing facility, bathroom that can large amounts of water process food, paper, clothing, chemicals, without pretreatment, or primary metals, all of which would be developing countries. Because the value of the natural resources (water, electricity and other water supply) is a precondition to encourage investment of such production facilities.

■ **Navigational**
Inland navigation for goods transport, compared with land and air freight, has many socio-economic and economic advantages. Inland navigation is also well suited for handling large quantities of cargo and from with large dimensions. For these reasons, nations have encouraged inland navigation on roads and inland water routes. The control of water in water routes for navigation requires water storage, and this can be an important role for the hydro-power generation and transportation.

■ **Environmental services**
Water storage infrastructure can keep the healthy life of rivers through ecological protection and water order environmental services. They can offer ecological services flows during dry seasons which enable the preservation of many aquatic animals and plants during drought. Moreover, more and reservoirs contribute to stabilizing ground water levels in adjacent land areas. Reservoirs can also be used to create new and biologically rich wetlands and to improve wetland habitats or natural forests.

We, therefore, call for joint efforts to develop water storage infrastructure in a sustainable way.

Today, water and energy schemes can be built in a safe, economic, and eco-friendly way. Many financial and energy services are available today and need to be developed in an integrated approach. Based on the multi-faceted and cross-boundary nature of water issues in the present world, we call for:

- Continued cooperation among nations, authorities, government authorities, research institutions, business, and academic, local communities and so on, to speed up the development and implementation of effective and sustainable water storage.
- Development of sharing water with new water cooperation to better serve regional requirements for water, food and energy.
- Improved policies, guidelines and protocols to evaluate and mitigate environmental and social impact of various storage options and to address the complex challenges of water storage.
- Funding agencies to offer advice to countries which need water storage, promoting national and regional development, with necessary financing mechanisms.

In conclusion

- Water is life and water storage infrastructure is an indispensable for society.
- Investment in water storage infrastructure is investment in the green economy.
- The services that people will be needed in the mitigation of, and adaptation to, climate change.
- The increasing demands for water, food and energy, it is time to develop solutions for better use of water resources, especially for developing countries, and to search public cooperation with water.
- A balanced approach, considering long-term and short-term views, is required, one that takes into account sustainable development, with full consideration to maintain strategic impact.
- The organizations signing this Declaration commit to collaborate with all partners and stakeholders that share this common vision.

Approved on 5th June 2012 in Kyoto, by:
The International Commission On Large Dams (ICOLD),
The International Commission on Irrigation and Drainage (ICID),
The International Hydro-power Association (IHA),
and the International Water Resources Association (IWRA).





DROUGHT IN CALIFORNIA (USA). APRIL 2015





California drought made worse by climate change say scientists

Water shortages: climate change may not have caused California drought, scientists say, but global warming is making situation worse.





Strategies: Communication (1)

- **Communication -**
 - **A clear communication plan to highlight the following themes:**
 - **Description of the current situation, the challenges we currently face.**
 - **Climate Change - what the future might look like and how the current picture will worsen in the future, specially focusing around:**
 - **How lack of water will likely impact health conditions, quality of life, food and energy production.**
 - **How the lack of adequate water storage will impact our capacity to respond to challenges such as droughts and floods, which the general public in developed countries is generally sensitive about.**
 - **Alert of the risks of delaying the necessary actions.**



Strategies: Communication (2)

- **Adapt these messages to the communication channel:**
 - **Traditional media (TV, magazines, radio)** - mainly through adverts and opinion pieces in specialized publications. Messages can be longer and include facts and evidences to support the message. We should avoid using a sensationalist tone of voice and **focus on using scientific evidences and real life cases of people affected by Climate Change.**
 - **Digital (social media, websites)** - Social media channels present a **great opportunity to disseminate our message at a very low cost and to reach a wider audience than traditional media does, especially younger audiences and those living in developing countries.** With a clear social media strategy we should be able to raise awareness of the challenges we face and solutions we propose. We should use **Twitter, Youtube and Instagram, the most popular social networks among those in the age range of 16 -24, to show visual proof of these challenges and what the future might look like, and Twitter, Facebook and LinkedIn to share and disseminate opinion pieces and articles.**



Strategies: Education

- **Organize and develop Education campaigns in schools and other educational levels, explaining the expected effects of Climate Change and the need to find solutions now to avoid greater evils.**
- **Provide teachers with documents and graphical information on reservoirs that explain the advantages and disadvantages of the alternatives to supply water for health and food in the context of Climate Change.**



Strategies: Political

- **Creation and promotion of International Forums (like the World Water Forum) and National (with participation of professional organizations like ICOLD National Committees) for collaboration between authorities, non-governmental organizations and the scientific and technological sectors.**
- **Working with the scientific community, we should aim to bring politicians and lobbyists on board and get them to think in a preventative way - the cost of investing for solutions now is lower than the cost to fix them once they have already happened.**
- **These forums should also identify the areas with the most acute needs and risks in the years to come and plan actions within the described preventative approach.**



Strategies: Objectives

- **Maintenance of existing and creation of new reservoirs** - As the above three components succeed; we should get more funds and political and social support to carry out the maintenance of existing and creation of new reservoirs, prioritizing those areas where they are most needed.
- **Manage reservoirs to meet the growing demands of the population and to fight against emergencies created by extreme events (droughts and floods).**
- **Design and build new dams and reservoirs:**
 - Complete hydraulics systems by constructing small dams.
 - Increase the number of large reservoirs by analyzing current and future water needs.
 - Design flexible solutions adaptable to the characteristics of the sites.



Final Conclusion.

- **In short, we must:**
- **Alert of the risks delaying the start of the necessary actions, which by their own nature require years to be implemented.**
- **Develop these strategies urgently because against the effects of Climate Change any delay would increase the damages.**



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VII MÁSTER INTERNACIONAL EN EXPLOTACIÓN Y SEGURIDAD DE PRESAS Y BALSAS



OCTUBRE 2016
JUNIO 2017

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Comité Nacional
Español de Grandes Presas



Escuela de Ingenieros de
Carreteras, Canales y Puertos

Organizan:



Asociación Española
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Fundación Aspa
de Reservoirs



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**MUCHAS GRACIAS
POR SU ATENCIÓN**