



IRD 2016 report

overview

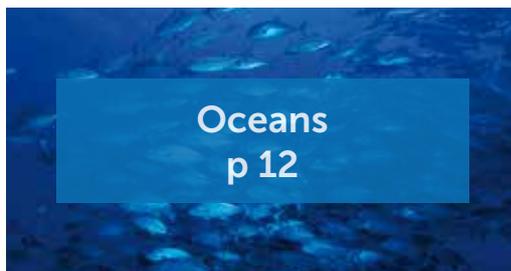
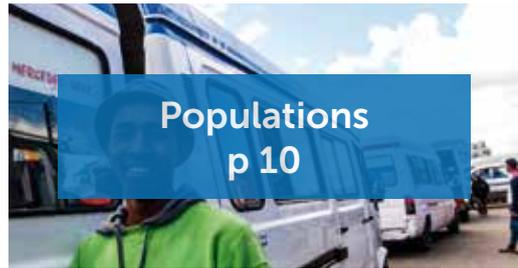
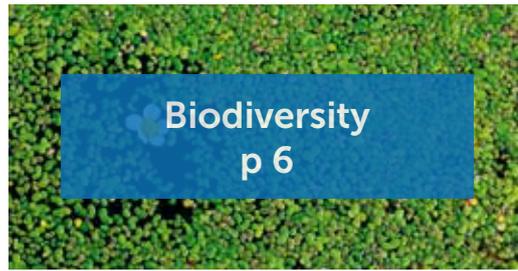
of the French National
Research Institute for
Sustainable Development

French National Research
Institute for Sustainable
Development



Institut de Recherche
pour le Développement
FRANCE

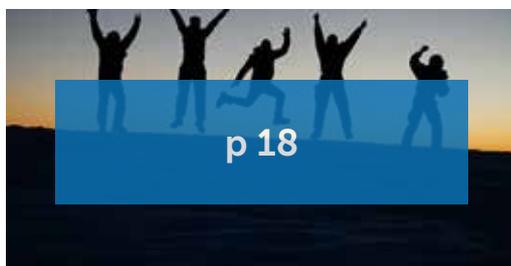
◊ Challenges and solutions



◊ Partnerships and innovations



◊ Dynamics and communities





The unprecedented international mobilisation of the scientific community seen during the March for Science on 22 April 2017, instigated by our American colleagues – including the appeal of the French President on 1 June 2017 to foreign researchers, inviting them to come to France, where they could pursue the fight against global warming – serve to remind us, as if proof were necessary, that the challenges facing us and affecting the future of the entire planet mean that it is essential to defend responsible, committed and genuinely independent scientific research, free from special interests of any kind.

You will therefore see in this report on our activities over the last year that this conviction is entirely in keeping with the missions of the IRD, which we clarified and restated in 2016.

Major restructuring projects at IRD – the modernisation of the central services, changes to the network of representatives, set-up of regional delegations, etc. – were undertaken throughout 2016. We carried out this work whilst remaining very active in promoting our scientific results at major international forums and debates on development, such as the United Nations Sustainable Development Summit held in New York in late September, the UN Conference on Housing and Sustainable Urban Development (Habitat III) held on 17-20 October in Quito and the United Nations Climate Change Conference (COP 22), held on 7-18 November in Marrakech.

Our Strategic Direction Plan for 2030, approved by the Board of Directors in July 2016, focuses our involvement in scientific research on the intertropical regions and the Mediterranean area, based on equitable scientific partnerships with the higher education and research communities in the countries and regions concerned. IRD is also working on the opening up of both society and the economy to science, which enables greater technology transfers, co-creation of new knowledge, technologies and services: responsible innovations for developing countries, in places where local constraints and requirements tend to favour the use of innovation and not necessarily following the same routes as those used in more advanced countries. The Strategic Direction Plan has been deployed operationally following the signature of the Institute's performance contract with our supervisory authorities in April 2017, the result of shared discussions held throughout 2016.

I therefore hope that this annual report is a fair and accurate reflection of the added value that our Institute provides to research in general, and of its contribution to the human and sustainable development sciences, in particular.

Now and in the future, we are more committed than ever to a stronger IRD, with a wider influence, devoted both to progress in the universal knowledge and scientific diplomacy of our country.

Jean-Paul Moatti
Chairman and CEO of IRD

Population health

With regard to the major health issues covered by the Sustainable Development Goals, the aim of IRD's "Health and Societies" department is to contribute to efforts to improve the health of populations in the Global South. The work done combines two complementary aspects of research: improving knowledge and conducting research projects on the one hand, and intervention or operational research with a direct impact on populations and support for control programmes on the other.

The focus is on a multidisciplinary approach, combining biomedical sciences with human and social sciences.

 **213** AGENTS INCLUDING 106 RESEARCHERS,
107 ENGINEERS AND TECHNICIANS

 **11** JOINT RESEARCH UNITS

 **7** JUNIOR TEAMS
ASSOCIATED WITH THE IRD

 **6** JOINT INTERNATIONAL
LABORATORIES

And in the future?

When it comes to health, a change of approach is necessary in light of the epidemiological transition (rapid development of chronic and non-transmissible diseases) but also due to environmental and economic imperatives: we need to move on from a "disease" based approach to a much more "systemic" approach (reflected in the one health concept). In this respect, research into interactions between health and environment in the widest sense (biodiversity, climate change, food system optimisation) and the functioning of healthcare systems will be stepped up. IRD's work will focus on two areas as a priority:

- ▶ surveillance, preparation and response to epidemic threats
- ▶ access to quality care and treatment

Global alliance receives €11.9M to combat Zika

ZIKAlliance, a multidisciplinary, multinational research consortium, received €12 million from the European Union's Horizon 2020 research and innovation programme to conduct an extensive three year project on infection by the Zika virus (ZIKV) in Latin America and the Caribbean. IRD is a partner in this project.



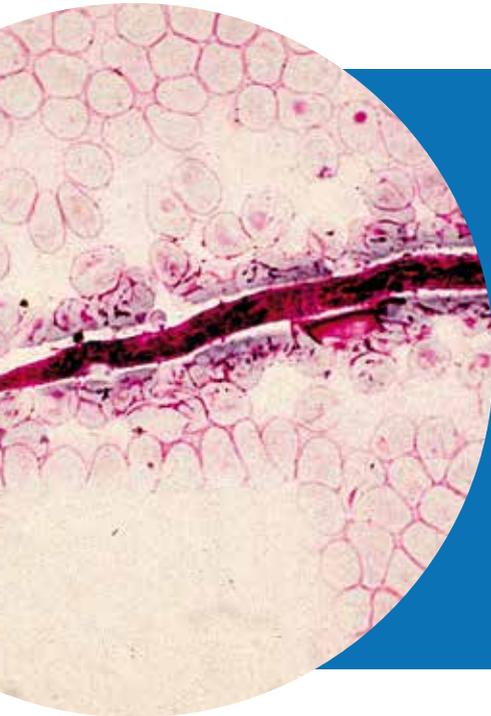
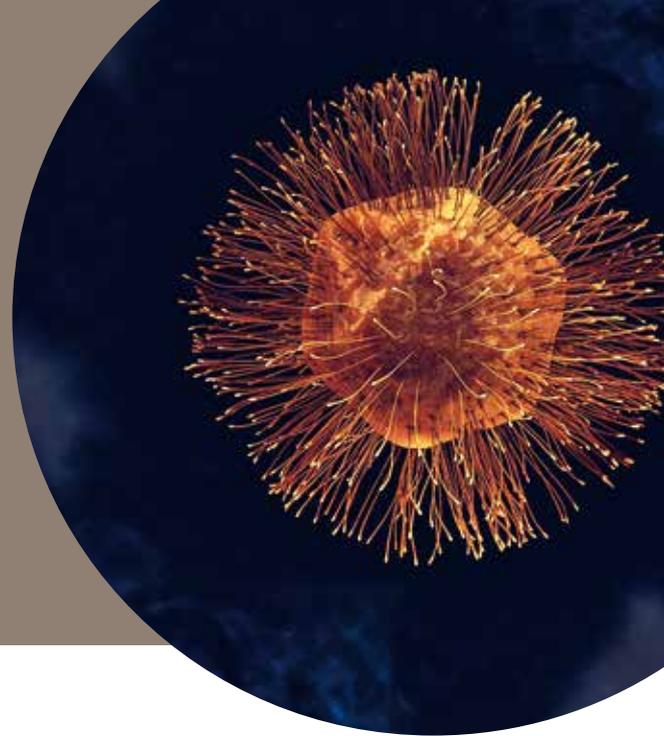
For more information

An "immune" system in giant viruses

IRD researchers and their partners have highlighted the existence of a system of defence among giant viruses – or giruses – capable of preventing the infection of the latter by virophage viruses (viruses that can infect other viruses).



For more information



A more harmful illness than originally believed

Loiasis, the parasitic infection predominantly found in central Africa, is not as benign as first thought. Highly infected people may in fact have reduced life expectancy. This is the finding of a new study, conducted by IRD and its partners in Cameroon with support from the Drugs for Neglected Diseases initiative (DNDi), covering more than 3,000 people.



For more information

Enriched rice: twice as many intestinal parasitic infections among children

A vast study, run as part of a partnership and involving 10,000 children in Cambodia, revealed that the consumption of rice enriched with vitamins and minerals doubles the risk of infection of a small intestinal worm. This parasitic disease can affect health.



For more information



Biodiversity

The scientific questions raised by the "Ecology, Biodiversity and Continental Ecosystem Functionin" department primarily look at the role of living organisms and environments and their interactions.

- ▶ the functioning of continental ecosystems and the services they provide to communities;
- ▶ the adaptation of continental ecosystems to global changes (uses and climates);
- ▶ protecting diversity;
- ▶ their resilience to global and demographic changes;
- ▶ the relationships between continental systems and the climate mechanisms.



285

**AGENTS INCLUDING 118 RESEARCHERS,
152 ENGINEERS AND TECHNICIANS
15 POST-DOCTORAL RESEARCHERS OR
INTERNATIONAL VOLUNTEERS**



11

JOINT RESEARCH UNITS



9

**JUNIOR TEAMS
ASSOCIATED WITH THE IRD**



6

**JOINT INTERNATIONAL
LABORATORIES**

And in the future?

As biodiversity is a factor in several Sustainable Development Goals and plays a key role in meeting people's food, energy and cultural requirements, the IRD's teams will continue their research into the threats to biodiversity, its erosion and its standardisation at a global level. In this respect, they will ensure that open science approaches are introduced, involving teams of researchers, decision-makers, managers and users.

As part of IRD and Cirad's efforts to align their respective collaboration arrangements in partnership with the South, IRD has expressed the wish to join the Innovation and Variety Improvement in West Africa research and teaching partnership (DPIAVAO). The two organisations are thus jointly holding the 2017 "Sustainable Intensification" conference in Dakar.

In 2017, IRD also plans to join the Phytobiome Alliance (an industry/academic collaborative initiative to build a foundation focused on phytobiome-related studies).

Pixibinthus: a new species of cricket in New Caledonia

Since the re-emergence of the main island of New Caledonia 37 million years ago, very few studies have looked at the evolutionary history of insects. Working in collaboration with a team from MNHN (The French National Museum of Natural History), IRD researchers have studied the evolution of a grasshopper native to New Caledonia. On the basis of a phylogenetic study, they traced its evolutionary history and highlighted the insect's ecological specialisation.

For more information



Water quality and *E.coli* dynamics in Asia

A team from IRD and scientists from Vietnam, Thailand and Laos studied the dynamics of the *E.coli* bacteria in three watersheds in southeast Asia. The presence of the *E.coli* bacteria is an indicator of faecal contamination of water supply systems. These teams developed new sampling protocols and demonstrated that the type of vegetation combined with the presence of mammals plays a crucial role in the bacterial load found in the water.

For more information



Maize pests impacted by the climate

In East Africa, the caterpillars of two moths, *Busseola fusca* and *Chilo partellus*, are major threats to maize, the main food crop grown in the region. Recent work by IRD researchers and their partners in Kenya has demonstrated that their distribution varies with altitude. *Busseola fusca* prefers mountain slopes while *Chilo partellus* is dominant at lower altitudes. A new study has thrown light on this phenomenon. Temperature plays a role at several levels, suggesting that the populations of the two pests will evolve in the years to come.

For more information



◆ Global changes, risks and hazards

IRD research teams in the "Department of Internal and Surface Dynamics of Continents" study the functioning of the Earth's system via its physical and biogeochemical dynamics, subject to global changes (climatic, economic and demographic). The research work focuses on two main seminal areas: observation and modelling of the continents' physical environments, and the interactions between changes to the physical environments and socio-economic dynamics.

The scientific goals are the understanding of global changes and above all climate change, the quantification of hazards, risk mitigation for populations, and the prospects for new resources.



222 AGENTS INCLUDING 123 RESEARCHERS,
99 ENGINEERS AND TECHNICIANS



14 JOINT RESEARCH UNITS



7 JUNIOR TEAMS
ASSOCIATED WITH THE IRD



8 JOINT INTERNATIONAL
LABORATORIES

And in the future?

The "coastal areas" and "impacts of mining" themes, seminal programmes for IRD, will be consolidated in 2017.

Setting up an interdisciplinary study of integrated water resources management, monitoring, extreme events, climate change interactions between climate and ocean, will be a priority in 2017.



Satellite technology for monitoring water resources

At COP22 in Marrakech, IRD, together with the Agence française de développement, the Centre national d'études spatiales, the NGO named OIEau, the Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture and the companies CNR and BRLI, signed a joint agreement on satellite technologies for use in monitoring water resources. These institutions have come together to work on new approaches to water resource monitoring using spatial data.

For more information



Protecting the Ice Memory

The first mission of the international scientific project to protect the world's ice heritage, the *Ice Core Initiative*, was launched in France in August/September 2016.

For more information



Pedernales earthquake: French and Ecuadorian scientific collaboration

After the fatal earthquake in Pedernales (Ecuador) on 16 April, French and Ecuadorian researchers worked together within the French post-seismic unit (CNRS/INSU) to restore and reinforce the seismic surveillance network, analyse new data, and undertake new scientific missions.

For more information



Volcano super eruptions: a new take on pyroclastic flows

An international study, headed by IRD researchers and their partners, shed new light on the physical mechanisms responsible for pyroclastic flows caused during volcano super eruptions. These results, which can be used to better assess volcanic hazards, were published on 7 March 2016 in *Nature Communications*.

For more information



Slow slip events can trigger earth tremors

A study has demonstrated that slow earthquakes (slip events that are imperceptible and go on for several weeks or months) can trigger a real earthquake. It proved that the 7.3-magnitude earthquake that occurred in Papanoa on 18 April 2014 was the result of a slow slip that began two months earlier in the Acapulco region (Mexican state of Guerrero).

For more information



◆ Societies in the tropical and Mediterranean regions

The Societies and Globalisation department's main objective is to understand contemporary societies in the tropical and Mediterranean regions while analysing the dynamics, transformations, adaptations and resistances that underlie and drive them. The research conducted takes an interdisciplinary approach to social challenges, with the aim of demonstrating their implications and relevance for countries in both the South and the North. The various research programmes strive to understand the dynamics at work in the diverse array of societies. They all have in-depth knowledge of the field and apply their approach at several levels.

Anthropology, economics, geography, demography and sociology are the main disciplines represented. The department also includes archaeologists, historians, legal experts, urban planners, political scientists, statisticians and linguists, as well as several environment and life science researchers (agronomy, ecology, pedology, hydrology, health, remote sensing, modelling and geomatics).

 **274** AGENTS INCLUDING 188 RESEARCHERS,
67 ENGINEERS AND TECHNICIANS

 **14** JOINT RESEARCH UNITS

 **8** JUNIOR TEAMS
ASSOCIATED WITH THE IRD

 **7** JOINT INTERNATIONAL
LABORATORIES

And in the future?

Through dedicated cross-disciplinary seminal projects (PSI), IRD will give special attention in 2017 to questions on urban dynamics and their link with sustainable development. We will also look at population migrations, mobilities and circulations.

IRD will also contribute to work aimed at measuring progress with and assessing Sustainable Development Goals, plus work on the vulnerability of territories and human groups and individuals faced with changes in socio-ecosystems.

The WIODER project

The WIODER (Western Indian Ocean Delta Exchange and Research network) project, jointly financed by CRDI (Centre de Recherche pour le Développement International, Canada) and IRD, was set up to structure a research network working on the present-day evolution of deltas in the Indian Ocean.

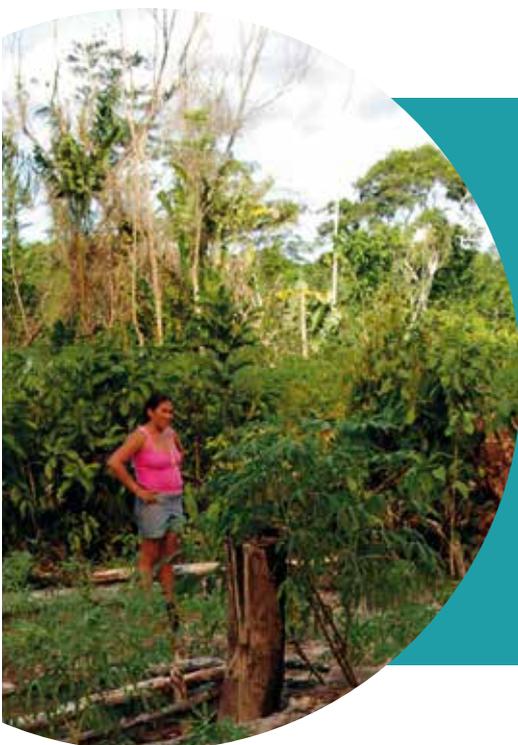
For more information



Twenty years observing Madagascar's countryside

In Madagascar, the Rural Observatories were first set up in 1995 as part of the MADIO (Madagascar-Dial-Instat-Orstom) project. A colloquium was organized to mark the 20th anniversary of Madagascar's Rural Observatories on the 9-10 November 2016 in Antananarivo.

For more information



The Odyssea project

Coordinated by the UMR Espace-Dev unit, the European Odyssea project comprises a multi-disciplinary, cross-sector European and Brazilian team of international repute. Its goal is to build a ground-breaking multi- and cross-disciplinary observatory to audit and assess interactions between Amazonian societies and their environments.

For more information



Human sciences research in Cambodia

Launched in October 2016 and coordinated by Inalco (national institute for oriental languages and civilisations), this three-year project aims to develop and structure a social sciences research and innovation policy in Cambodia.

For more information



Plastic "continents": is there a way out?

The "continents" of plastic are not in fact static. On the basis of modelling work on ocean circulation in the Pacific, IRD and CNRS researchers have demonstrated that there are "exit route" from these large zones where waste accumulates.



For more information



Climate: large-bodied fish not punching their weight

When it comes to withstanding environmental hazards, size does not matter. On the contrary: large fish are the most vulnerable to the rise in temperatures and human activity, as demonstrated by an international study conducted in the Pacific and Indian oceans.



For more information

The scientific community working to protect the coral reefs

Several studies have been conducted by IRD researchers and their partners to forge better understanding of how the coral reefs work so we can protect them.



For more information



◊ IRD, inspiring change

In an ever-changing world, science helps decrypt the dynamics at work, helps us understand them and come up with solutions to assist with change in a more sustainable manner, which could not be achieved without appropriate knowledge, technology levers, and innovations developed on a large scale.

We need to invent solutions that facilitate knowledge, the understanding of complex issues and communication, and which help us live better with less.

Technology transfers are not the only solution. Solutions have long been invented in countries in the Global South, based on traditional knowledge or born of the need to come up with responses in highly challenging environments. Good ideas, often the outcome of research, are spread.

Since science provides knowledge of contexts, challenges and levers, and enables break-through innovations with a greater social impact for technologies and services, it can help reconcile economic growth, human development and the protection of ecosystems; it helps create solutions that enable the design and development of sustainable development.

Science can fulfil this role all the better when it is open and involves complementary partners the full length of the research/innovation chain. Open science is another way of approaching science, bringing on-board partners to "co-research" very early on in the process. It means it remains in tune with priority requirements and respond to challenges in an optimal manner.

Today, we need to support this process of opening up science to society, in countries in the North and in the South, to support research communities in the Global South, open laboratories up to society, stimulate creativity and support the building of innovation capacities.

At IRD, mobilising research means ensuring the economic value of research (technology transfer) but it also means open science, "research together", to strengthen research's contribution to society.

 SUPPORT PROVIDED FOR MORE THAN
100 INNOVATIVE COMPANIES

 **118** AGREEMENTS SIGNED WITH
THE PRIVATE SECTOR

 **10** JUNIOR TEAMS
ASSOCIATED WITH THE IRD

• And in the future? •

IRD will gradually shift towards long-term partnerships with companies looking to invest and test new forms of production and sustainable consumption, where research questions are devised jointly and where close relations between partners will improve the result attained.

In liaison with IRD researchers and partners, the project to revise the intellectual property strategy was initiated in 2016. This process, bringing together the Institute's experts and academic and non-academic partners, will be continued over 2017 to result in the introduction of a new intellectual property policy at IRD.

Promoting research and innovation

The IRD supports "Protect to Share" and strives to ensure its practices for the economic value of research comply with its vision of science. It aims to maximise the value of its research, with a view to compensating contributions fairly and optimising access to research results for scientific communities and populations in developing countries and the overseas regions.



For more information



Capacity building

Capacity-building is a cross-cutting task, involving all the Institute's scientific activities, based on the belief that development entails independent scientific communities, open to social challenges.



For more information

Expertise

IRD can provide three kinds of expertise, on request: collective scientific expertise, institutional expertise or consulting, and private consulting.



For more information



◊ IRD across the world

In 2016, IRD introduced a new strategy for international presence, compliant with the objectives of the 2016-2030 Strategic Direction Plan and the ambitions stated by the governance keen to make IRD a world scientific benchmark for sustainable development issues. This new approach was applied throughout the year, with the introduction of a series of actions, coalitions and partnerships designed to promote the role of science and innovation when it comes to formulating responses the challenges of global changes and the role of partners from the Global South in the sustainable development agenda, and contributing to the visibility of French/Francophone research. To convey these messages to international, regional, European and partner country institutions, IRD has begun work to renew its network abroad and in French overseas territories, to rescale it and adapt it to this new strategic vision.

IRD's contribution to the international agenda

With regard to international organisations, IRD has worked with the governing bodies of Agenda 2030, most notably as part of the High-Level Political Forum (HLPF). The first session of the HLPF was held in New York from 11-20 July 2016 on the theme 'Ensuring that no one is left behind with sustainable development'. This was an opportunity to promote the role of research and the interaction between the SDGs during the plenary sessions and side events.

The Institute also calls on partner organisations to support research. This was the case at the general assembly of the United Nations in September 2016 when IRD, in partnership with the French mission to the UN, organised a special event on the fate of natural and environmental resources in the oceans. It was again the case at the 16th Francophonie Summit in Madagascar on 26-27 November 2016, where IRD explained the dynamics of Francophone research in partnerships and its role in reaching the SDGs. All in all, IRD and its partners were involved in 10 colloquiums, seminars and "16th Summit"-labelled schools in 2016.

The mobilisation of partners, particularly those from the Global South to encourage them to take on-board sustainable development issues, formed the core of the Institute's action. In this respect, it is worth noting IRD's high level of involvement alongside the Moroccan universities and French institutions at the Climate COP22 held in Marrakesh in November 2016, giving the Institute the opportunity to position itself as a benchmark stakeholder in the implementation of the Paris Agreement. Likewise, IRD's participation in the third United Nations conference on housing and sustainable development, Habitat III, held in Quito from 17-20 October 2016, was an opportunity to product the co-production of knowledge by scientific communities from Africa, Asia and Latin America.

And in the future? ,

IRD will provide input to the work of the HLPF and contribute to the reflections led by the panel of experts that includes Professor Jean-Paul Moatti, appointed to draft the 2019 Global Sustainable Development report. It will pursue its advocacy work before the development banks and will call on its partners ahead of the Climate COP23, Desertification COP13, the SDG 14/Oceans Conference in June 2017 and the World AIDS Conference. It will forge stronger links with the French scientific and diplomatic network and will coordinate its action with the Agence française de développement (AFD).

The IRD network abroad and in the French overseas territories

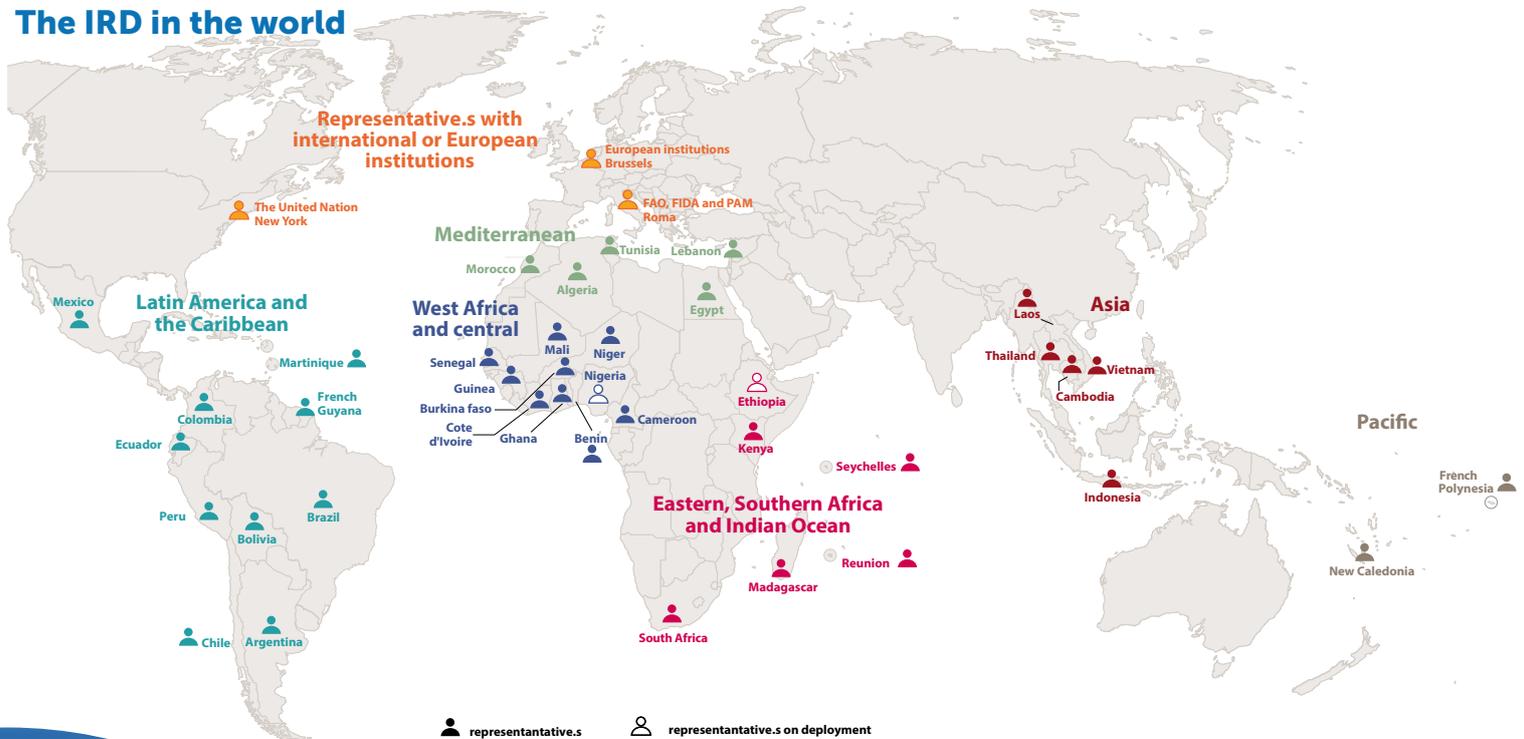
"The first mission of the IRD and its network abroad and in the French overseas territories is to contribute through research to the emergence, strengthening and empowerment of scientific communities and higher education and research systems in the countries in which it operates, while striving to respond to the population's requirements."
The Strategic Direction Plan for 2016-2030 (POS)



For more information



The IRD in the world



Research for development in Europe

In 2016, IRD introduced a new European strategy aimed at promoting the importance of research for development in helping formulate responses to the shared, global challenges confronting the European Union and developing countries and in encouraging dedicated alliances and theme-based networks.



For more information

◊ Dynamics and communities

 **2,019** AGENTS INCLUDING 805 RESEARCHERS,
1,214 ENGINEERS AND TECHNICIANS
292 AGENTS OPERATING UNDER LOCAL LAW

 **€232** MILLION
IN REVENUES

 **34.5%** OF AGENTS WORKING
OUTSIDE MAINLAND FRANCE

 **35** RESEARCHER POSITIONS
OPENED VIA COMPETITIVE SELECTION

Supporting agents in their working environments

Collective support for change is a major issue. IRD is keen that every agent is able to grasp the sense of changes in the working environment and is able to be a part of the dynamic process. Moreover, the Institute ensures support for individual careers via the human resources department. Finally, a psychosocial risk prevention scheme has been developed to prevent risk situations through training and awareness-raising.

For more information



An ambitious devolvement process

2016 was also the year in which IRD rolled out an ambitious devolvement process, with the set-up of four regional delegations for IRD in mainland France. They provide a set of services, pooling resources to support research in the units and the structures within their scope.

A 2016-2019 budgetary plan

Adopted along with the initial 2016 budget, this budgetary plan sets out five seminal objectives for the period:

- ▶ increasing our own resources as part of efforts to turn around public accounts through policy to diversify donors;
- ▶ protect and bolster scientific jobs of tenured researchers;
- ▶ optimise the position of the Global South;
- ▶ secure the support functions;
- ▶ rationalise support costs (real estate, purchases, IT, day-to-day management chain, etc.).

For more information



Promoting IRD's activities and values

The orientations set out in the Strategic Direction Plan urge us to question the Institute's communication guidelines, to overhaul institutional communication to position it within a new strategy for content and interaction, rolled out to the wider IRD "Planet", a community with a rich and unique set of ideas and practices.

The Communication and Information Sharing department's job thus comprises three main challenges: making the IRD's activity clearer and accessible, facilitating information sharing and the building of internal and external communities, and boosting the recognition and reputation of IRD.



For more information



Knowledge sharing

One of the stated priorities in the 2016-2030 Strategic Direction Plan is to "contribute to international knowledge sharing, innovations and the "benefits" that come from research, the unrestricted circulation of ideas and bringing people together".

In 2016, the priority for action devoted to sharing knowledge with the general public was climate change and society issues with exhibitions, conferences and debates, workshops and film screenings in France, the overseas collectivities and regions, and in our partner countries in the South.



For more information

A new dynamics of digital innovation

The department for the development of innovative digital usage (DDUNI) was reorganised in late 2016, in response to several objectives:

- ▶ taking into account the needs of all IRD's departments and their diversification;
- ▶ fostering the inter-operability of software with those used by other public scientific establishments;
- ▶ re-affirming the establishment's sovereignty over strategic choices and the adaptability of the information system;
- ▶ encouraging ongoing efforts for innovative uses.



For more information

A crucial player in providing scientific advice on the major challenges of development

The French National Research Institute for Sustainable Development (IRD), an internationally recognised multi-disciplinary organisation, is a French public research establishment operating under the joint authority of the French Ministry for Higher Education, Research and Innovation and the French Ministry for Europe and Foreign Affairs.

It takes an original approach to research, expertise, training and knowledge-sharing for the benefit of countries and regions, making science and innovation key drivers in their development.

 **ANNUAL BUDGET**
€230 MILLION

 **2,019** AGENTS INCLUDING 805 RESEARCHERS,
1.214 ENGINEERS AND TECHNICIANS,
292 AGENTS OPERATING UNDER LOCAL LAW

 **34.5%** OF AGENTS WORKING
OUTSIDE MAINLAND FRANCE

 **65** RESEARCH UNITS

 **ALMOST 1,300** PUBLICATIONS IN THE WEB OF SCIENCE OVER WHICH
52 % ARE CO-SIGNED WITH PARTNER SCIENTISTS
IN DEVELOPING COUNTRIES

© IRD/DCPI july 2017

Document by the Communication and Information sharing Direction
Graphic design by S. Toscano

Photographic credits:

Cover: © IRD/ J.-G. Kayoum

Inside: T. Vergoz - B. Moizo - O. Dangles et F. Nowicki - M. Taquet - C. Duos - O. Dangles - S. Del Ben, Wild Touch, Fondation UGA - Studio Cabrelli - R. Nil - CNRS - C. Bellec - F. Wieringa - MNHN, T. Robillard - E. Rochelle-Newall - B. Le Ru - NASA - J.-P. Verdesoto - B. Bernard - O. Dugornay - KENWEB Project - T. Chevallier - L. Empeaire - N. Henaff - Y. Bettarel - S. Andrefouet - F. Benzoni - L. Markwin - F. Beile - D.R. - C. Duos - F. Charleux