4

FISH RESOURCES

Photo by Eric Baran

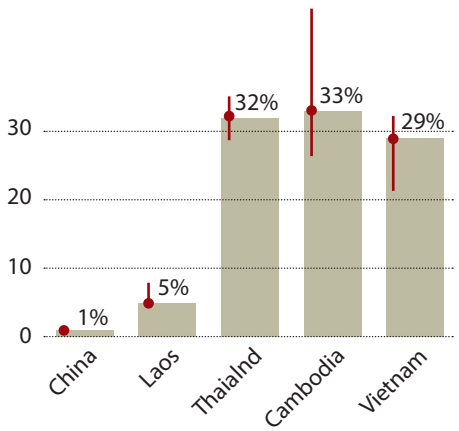
FISH RESOURCES

WORLD RECORDS

Cambodian inland fish resources are part of the Mekong system. With 781 known freshwater and brackish fish species, the Mekong Basin has the second highest fish biodiversity in the world after the Amazon Basin in South America (Froese, R. and Pauly, D. 2013). Cambodia itself features 461 freshwater species, plus 468 marine species and 26 species found in both environments. This makes 955 fish species in total. These numbers have increased over time as new species are discovered, and they vary slightly between studies as estuarine or diadromous species are sometimes counted as marine and sometimes as freshwater species.

The Mekong is also the biggest inland fishery in the world, yielding around 2.1 million tonnes of fish each year (Hortle 2009; Dugan et al. 2010). Cambodia contributes about a third of the Mekong fish catch.

Cambodian fish resources are also exceptional by global standards, and according to FAO data, Cambodia holds two world records:



Contribution of Cambodia to the overall Mekong fish catch (%), compared to the other countries of the basin. Source: Adapted from Baran 2010

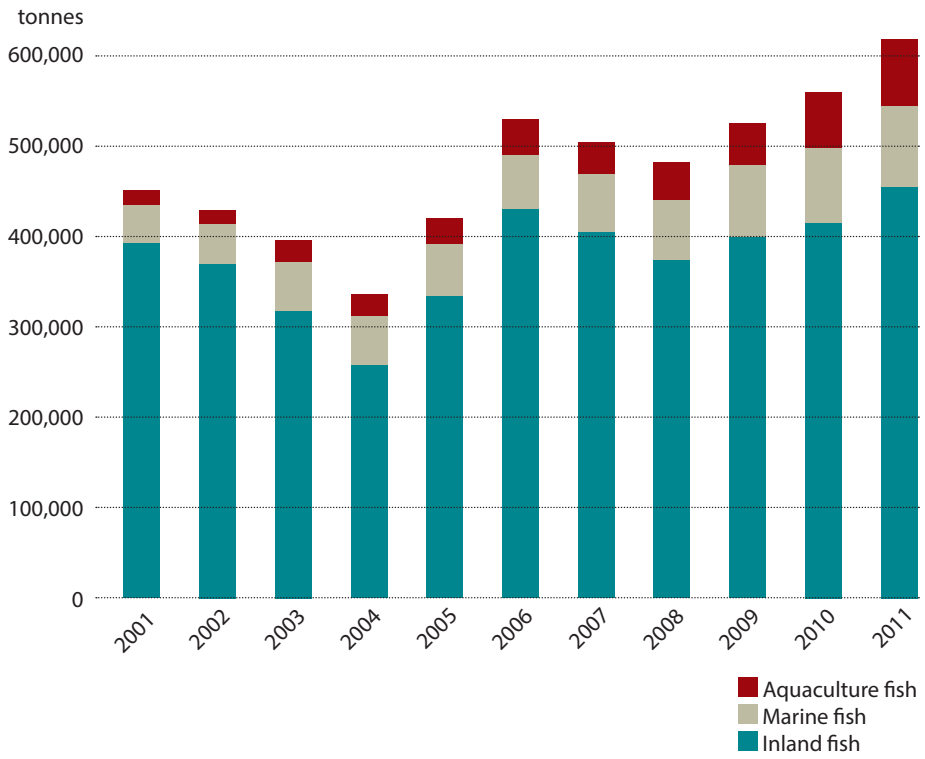
the highest catch of inland fish per inhabitant and the highest consumption of freshwater fish per inhabitant (Baran 2010).

FISH PRODUCTION

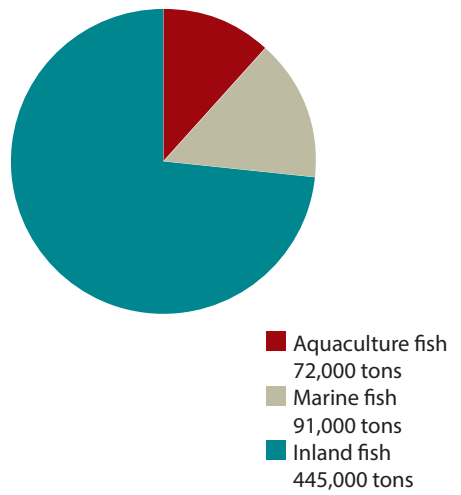
Over the past decade[1], subsistence and commercial fisheries and the aquaculture sector in Cambodia have combined to produce between 300,000 and 600,000 tonnes of fish each year, made up of, on average, 79% freshwater fish, 14% marine fish and 7% aquaculture fish.

The trend has been steady growth in the three sectors, with a 29% (linearized) increase in the inland fisheries sector between 2001 and 2011, while the marine fishery production doubled and aquaculture production increased five-fold during the same decade. However, the remarkable progress of the aquaculture sector (and of marine fisheries to a lesser extent) should not mask the fact that between 2001 and 2011 the modest growth of inland fisheries added more fish to markets than the expansion of the aquaculture sector (60,000 vs. 58,000 tonnes respectively). In other words, the aquaculture sector is growing fast but is small, and the inland fisheries sector grows much more slowly but contributes, by far, the largest share of the fish supply in Cambodia. In 2011, capture fisheries (i.e. fisheries targeting wild fish at sea and in rivers) yielded 536,000 tonnes of fish, and the aquaculture sector produced 72,000 tonnes of fish and 92 tonnes of shrimp. Thus, the overall fish production in 2011 was 73% freshwater capture fish, 15% marine capture fish and 12% aquaculture fish.

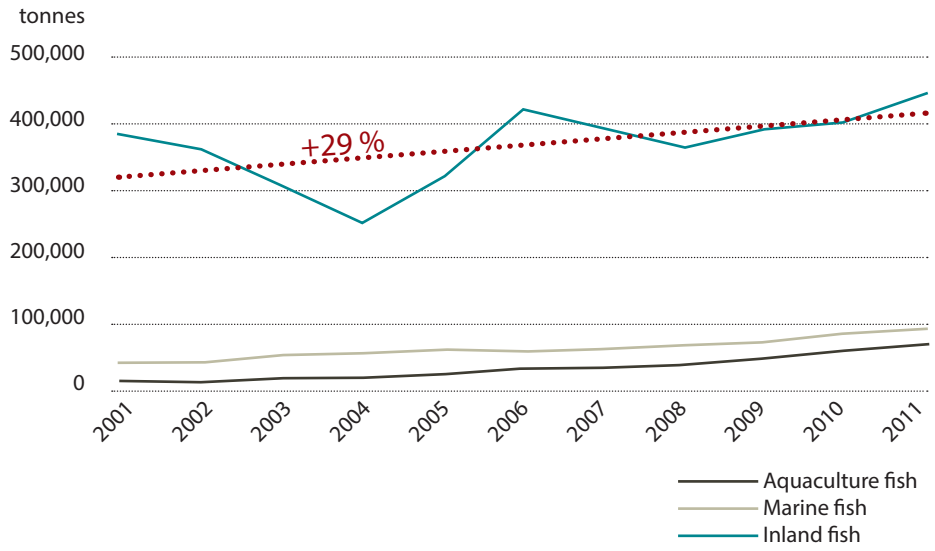
In 2011, four provinces produced more than 50,000 tonnes of fish each: two inland provinces (Kandal and Kampong Chhnang) and two coastal provinces (Koh Kong and Preah Sihanouk). Kampong Thom, Siem Reap, Battambang and Pursat provinces were also large suppliers of freshwater fish with 39,000 to 45,000 tonnes each, while Mondul Kiri, Oddar Meanchey and Preah Vihear were the least productive provinces, with a few hundred tonnes of fish each per year



Fish production in Cambodia between 2001 and 2011. Source: FiA 2002-2012

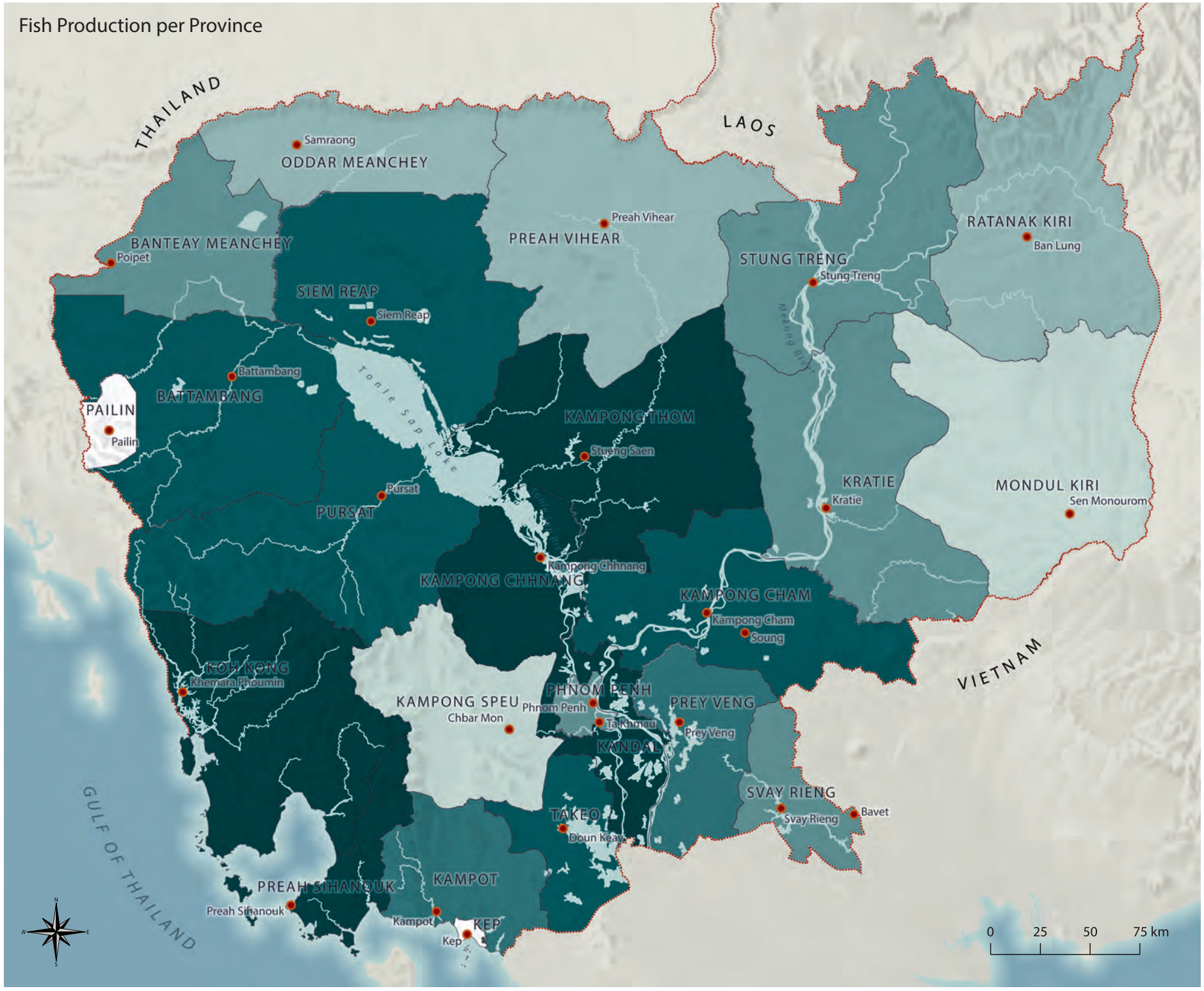


Components of fish production in 2011. Source: FiA 2011



Trends in fish production in Cambodia between 2002 and 2011. Source: FiA 2002-2012

Fish Production per Province



LEGEND

- Krong (City)
- International boundary
- Province boundary
- Water body

Total fish catch in 2011 (tonnes)

- 45000 -5 6000
- 25000 - 45000
- 20000 - 25000
- 5000 - 20000
- 2500 - 5000
- <= 2500
- No data

Data Source:
Fisheries Administration, 2011
http://arunatechnology.com
(Aruna Technology Ltd.)
Department of Geography (DoG), 2005

FISH CONSUMPTION

According to the FAO, the average fish consumption worldwide amounts to 18.6 kg per person and per year (FAO 2012). In Cambodia, a recent study from the Fisheries Administration (IFReDI 2013) found that the second largest food source after rice is aquatic resources (i.e. fish and other aquatic animals such as crabs, molluscs or frogs), at 173 grams per person and per day or 63 kg per person and per year. All together, fish and aquatic resources account for almost one-fifth of the total food intake (rice, fish, vegetables and meat combined). Aquaculture contributes only 2% of the total fish consumption.

Fish and aquatic animals are eaten much more than any other of the body building foods such as pork, chicken or beef: fish represent 76% of the total animal protein intake of Cambodian people (vs. 20% for meat and 4% for poultry). When fish production is compared with livestock production, the result confirms the large dominance of inland capture fish over Cambodian meat production.

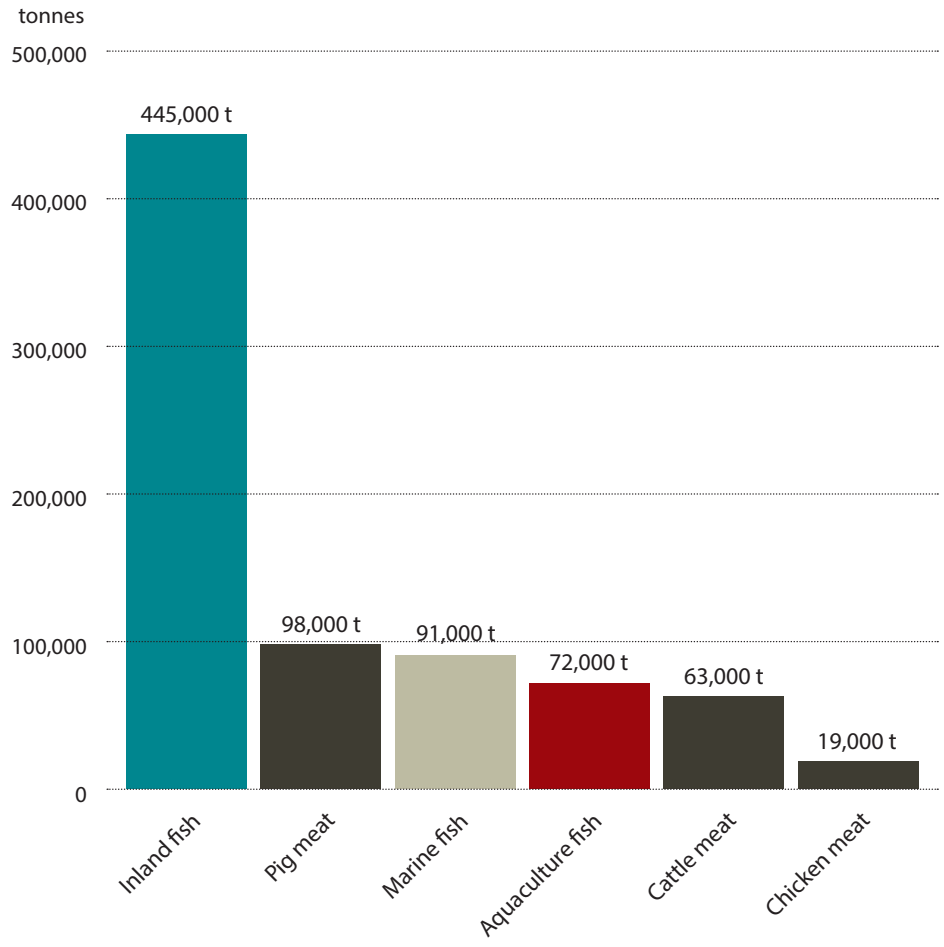
Thus, freshwater fish is consumed in much larger quantities than marine fish. In particular, 25% of the total fish intake is made of long-distance migratory freshwater fishes, that are very sensitive to dam development across rivers.

The data for fish consumption per ecological zone is from a study using 24 hour food recall interviews in 1,200 households randomly selected throughout Cambodia (Touch Bunthang et al. 2012). The survey looked at the five main ecological zones in the country (Phnom Penh, coastal zone, plateau/mountains, lowland plains and Tonle Sap area) and provides estimates of the total daily fish consumption (freshwater and marine fish, plus other aquatic animals and aquaculture fish) in each ecological zone.

The IFReDI study based on fish consumption (IFReDI 2013) concludes that the total fish production of inland fish reaches 570,000 tonnes per year. This assessment is not yet reflected in national statistics (509,000 tonnes of inland fish in 2012 according to catch estimates).

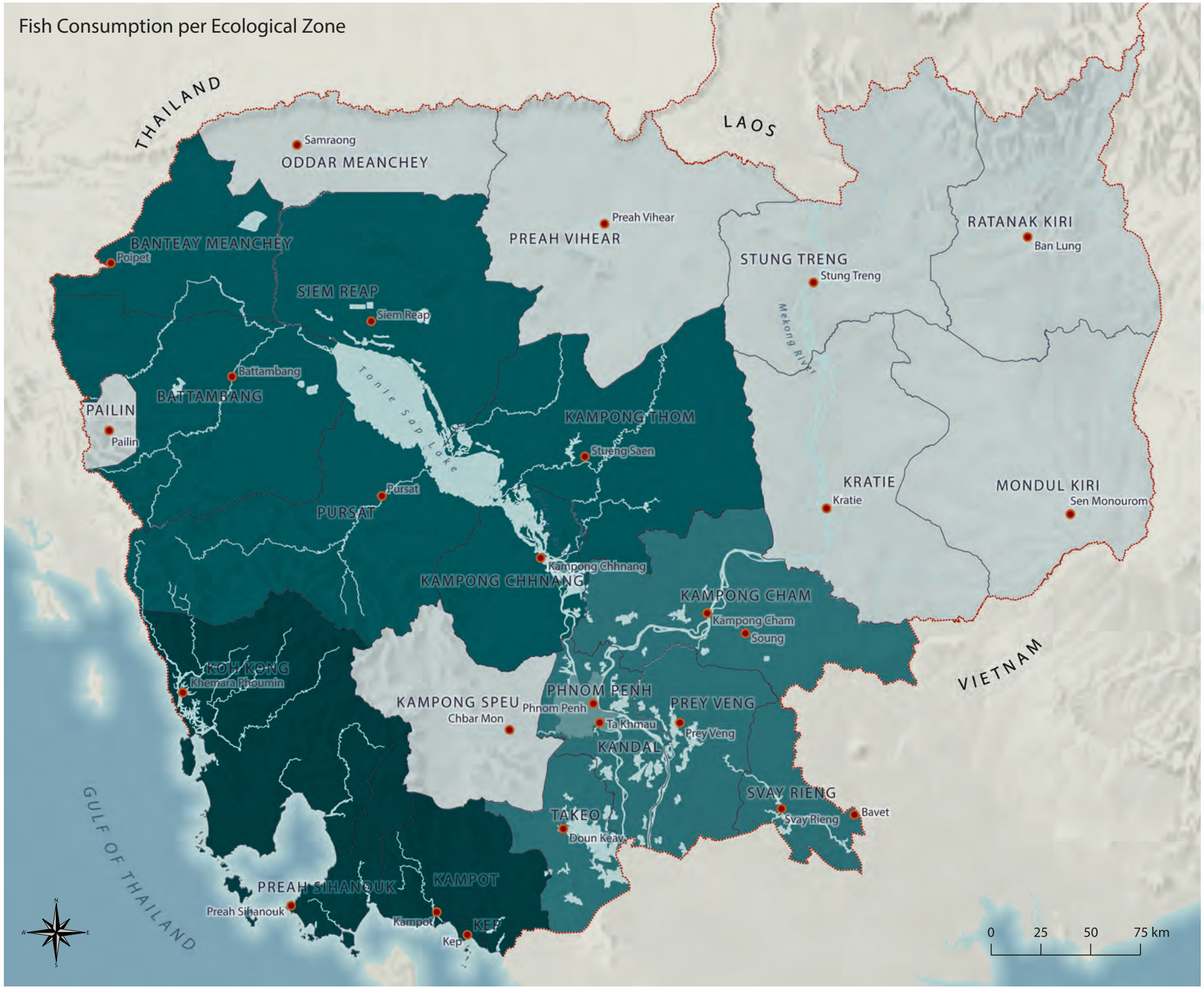
			Annual intake of fish and other aquatic animals (kg/person/year)	
Inland capture resources	Inland fish	Floodplain residents	18.8	40.3
		Long-distance migrants	15.5	
		Short-distance migrants	6.0	
	Other inland aquatic animals		3.9	3.9
Marine capture resources	Marine fish		16.2	17.4
	Other marine aquatic animals		1.1	
	Aquaculture		1.3	1.3
		Grand total		**63.0**

Average annual fish consumption per person and per year. Source: IFReDI 2013



The different sources of animal protein production in Cambodia. Source: FiA 2011 and 2011 online FAOStat data

Fish Consumption per Ecological Zone



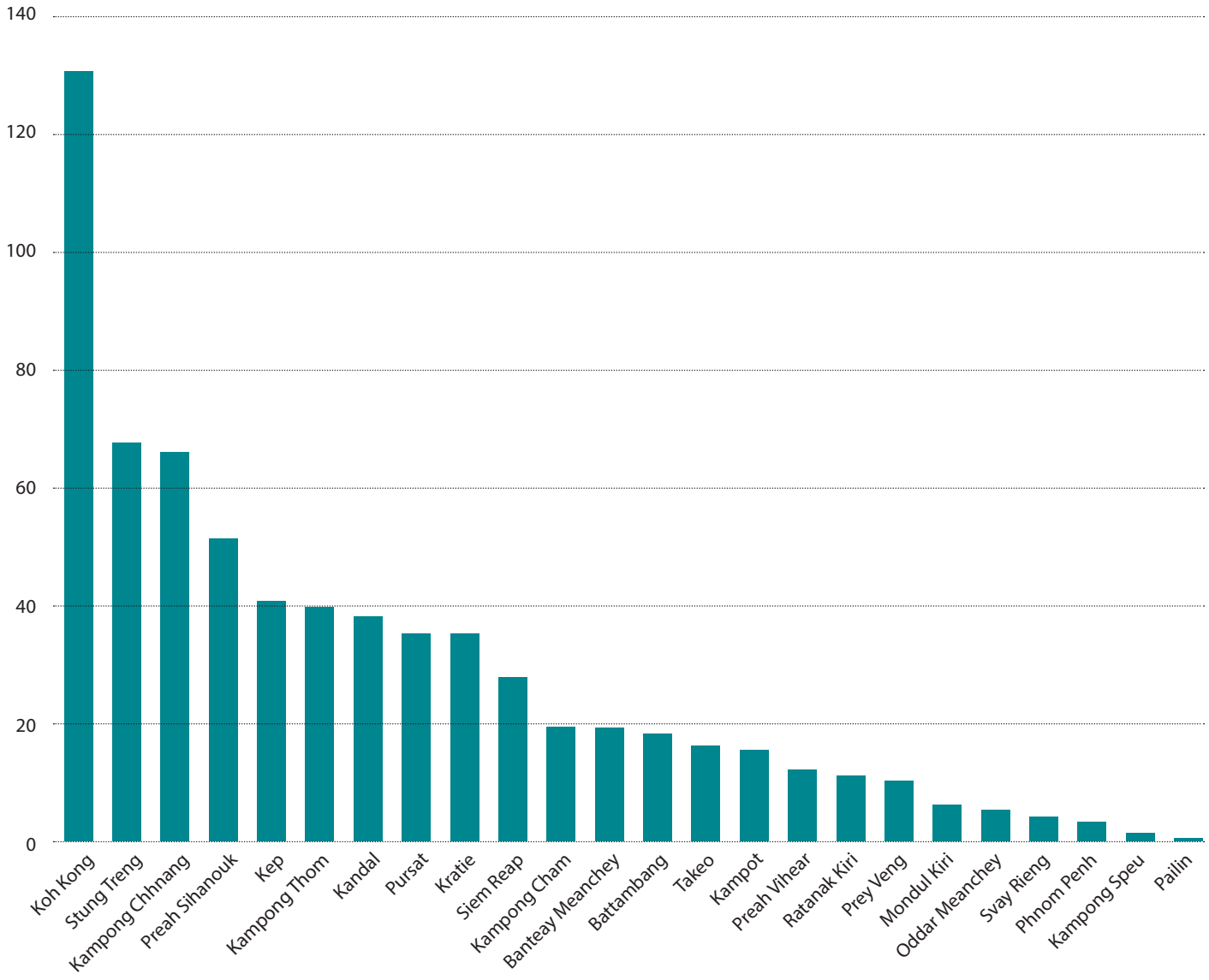
LEGEND

- Krong (City)
- International boundary
- Province boundary
- Water body

Zone based average yearly fish consumption (kg/person/year)

- 90,3
- 70,9
- 58,9
- 57,4
- 53,3

Data Source:
Inland Fisheries Research and Development Institute, 2013
http://arunatechnology.com
(Aruna Technology Ltd.)
Department of Geography (DoG), 2005



Fisher density (i.e. number of fishers per 1,000 persons) per province. Source: derived from Nasielski et al. 2013

DEPENDENCY ON FISHING

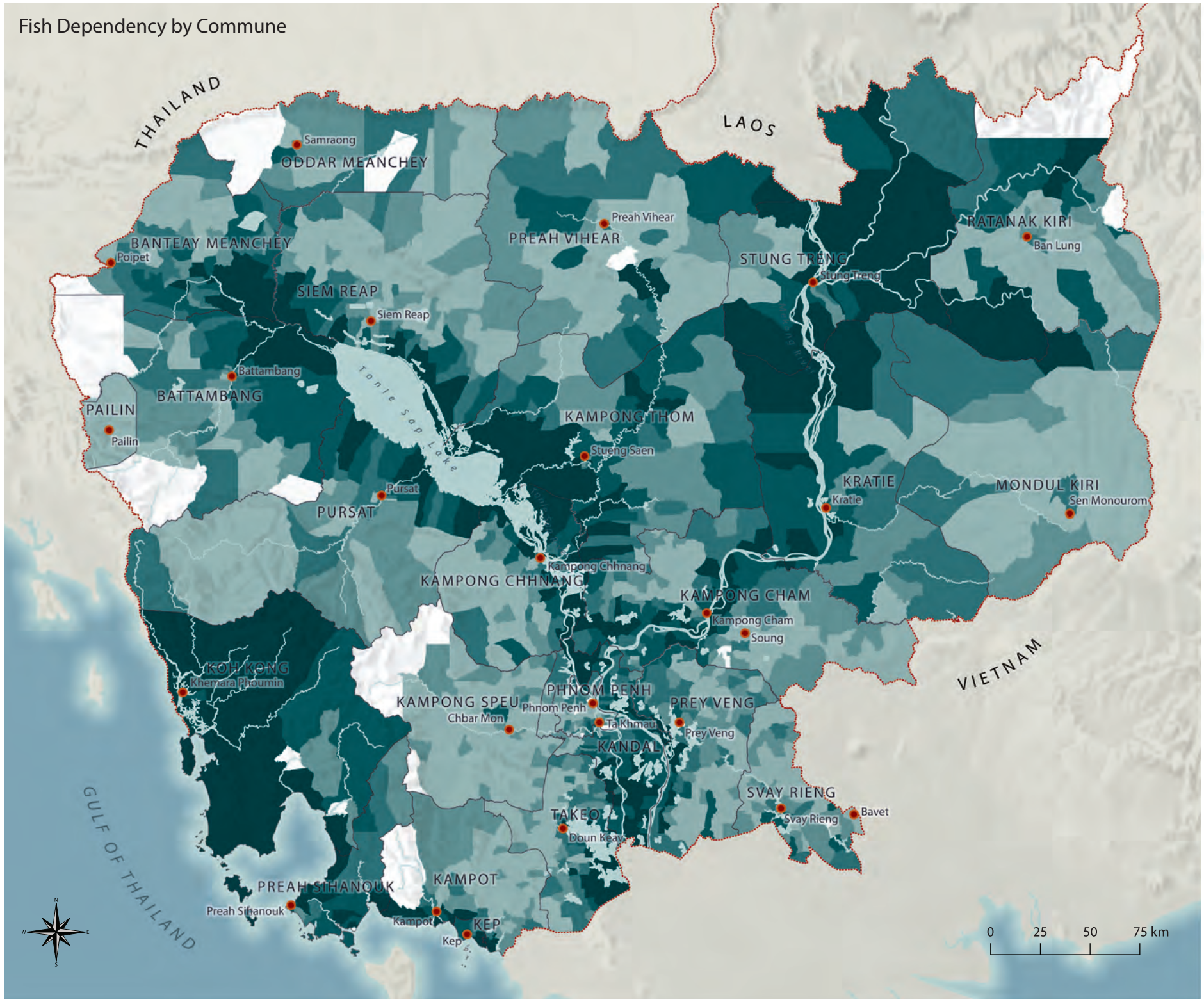
Given the abundance of fish in Cambodia and the limited production of livestock so far, fishing is part of all rural livelihoods, even though a minority of people consider themselves as professional fishers. In the 2008 census, only 0.6% of the population declared fishing as a primary activity, though 64% of all rural households are engaged in fishing (FAO 2010) and 85% of households (i.e. more than 11 million people) are rural (WB 2009). For this reason, Nasielski et al. (2013) developed a methodology capable of producing a more accurate estimate of fisher density and fishing dependency in Cambodia. The results show that Koh Kong is the province with by far the highest density of fishers, and that other coastal provinces such as Preah Sihanouk and Kep also feature a high density of fishers. On the inland side, it is Stung Treng that features the highest density of fishers, underlining the importance of fishing to livelihoods in this province, which benefits from the fish production of the Mekong mainstream but also of the Sekong, Sesan and Srepok Rivers. The provinces with the next highest density of fishers are Kampong Chhnang, Kampong Thom and Kandal.

The map of fishing dependency shows clearly that fishing dependency is highest along the coast, along the Mekong mainstream and along the main rivers (Tonle Sap, Sekong, Sesan, Srepok, Sen, Sanker and Monkol Borey Rivers). The provinces most dependent on fishing are those where water resources are abundant and where economic and agricultural alternatives are limited (Stung Treng, Kratie, Kampong Thom, Battambang, and Banteay Meanchey provinces).

Fishing dependency score

This score reflects the proportion of fishers in the population and the poverty level of the commune. Data on the proportion of fishers in the population is taken from the 2008 national census information on primary and secondary occupation. This number is complemented with the number of unaccounted fishers derived from the 2010 Commune database quantifying fishing boats. The proportion of fishers in the population is then weighed by the village poverty score produced for each village by the Ministry of Planning in 2006. This weighting reflects the fact that poorer communes are more dependent on natural resources, since they have fewer economic alternatives.

Fish Dependency by Commune



LEGEND

- Krong (City)
- International boundary
- Province boundary
- Water body

Fish dependency by commune

- Very high
- High
- Medium
- Low
- No dependency
- No data

Data Source:
Nasielski et al. 2013
http://arunatechnology.com
(Aruna Technology Ltd.)
Department of Geography (DoG), 2005

VALUE OF CAPTURE FISHERIES

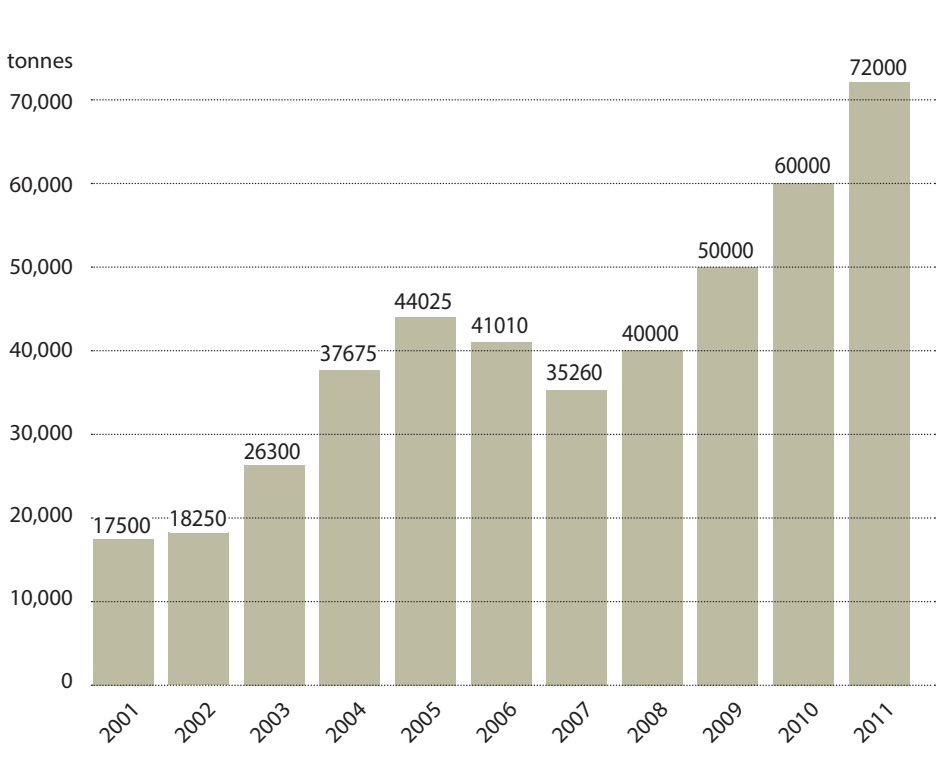
The value of capture fish production is not well known since there is no systematic assessment of the price of fish per kilogram; this results in an undervaluation of fisheries in the Gross Domestic Product (GDP) of Cambodia. The International Monetary Fund indicates that fisheries contributed 6.9% of the GDP in 2007, for a value of around USD 600 million at that time (IMF 2009). More recently, IFReDI (2013) estimated that at USD 1.6/kg the total economic value of freshwater fish and aquatic products reached USD 1 billion per year. The total value of fish production after processing and transportation is unknown but is thought to range between 8% and 12% of GDP (FiA 2009). Overall, the unknown value of inland fish production remains an information gap hampering decision-making.

In terms of employment opportunities, it is estimated that the fisheries sector provides full-time, part-time and seasonal work to around 2 million out of 14 million people, and that 10.5% of full time workers and 34% of part time workers are involved in fishing (FiA 2009).

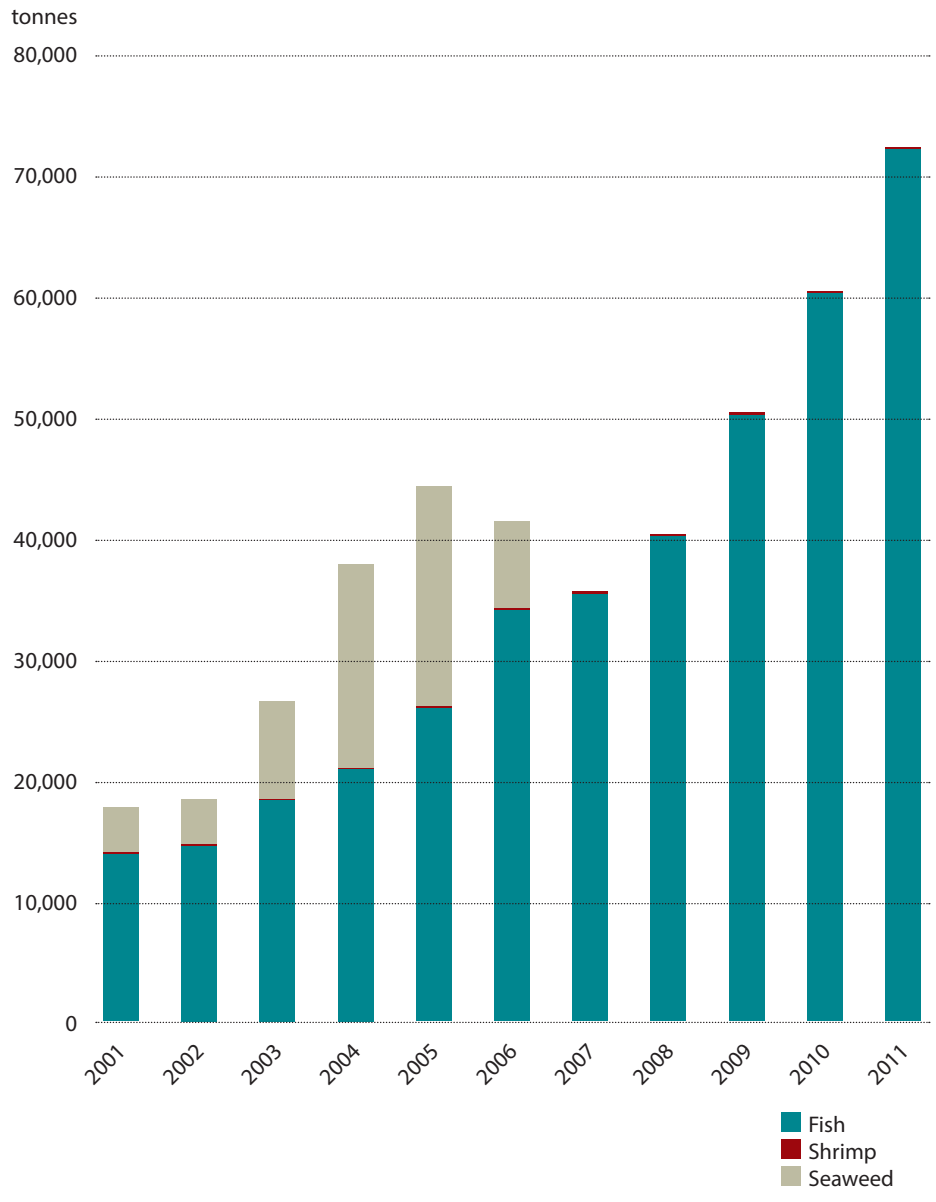
AQUACULTURE

The aquaculture sector has seen remarkable growth between 2001 and 2011. However, a more detailed analysis shows that the products of the aquaculture sector have been evolving. While freshwater fish production is always very dominant, seaweed production, initiated in 2001, was not sustained beyond 2006, and shrimp production remains very minor, with strong annual fluctuations and no clear growth trend.

Seven aquaculture systems have been identified in Cambodia (Joffre et al. 2010): cages and pens, intensive ponds, extensive homestead ponds, Community Fish Refuge ponds and integrated rice-fish farms in freshwater, and, in the coastal zone, fish farms and shrimp farms. Takeo has the most, with more than 19000 aquaculture ponds or cages, followed by Svay Rieng, Prey Veng and Kampot (between 9400 and 7000 each). The number of ponds and cages in the other provinces is much lower and varies between 1800 and 100 (FiA 2011). Among freshwater fishes, the main species farmed are pangas, silver barbs, tilapias, silver carps, common carps and snakehead fishes. Among marine fish species, the main species are sea bass and groupers.

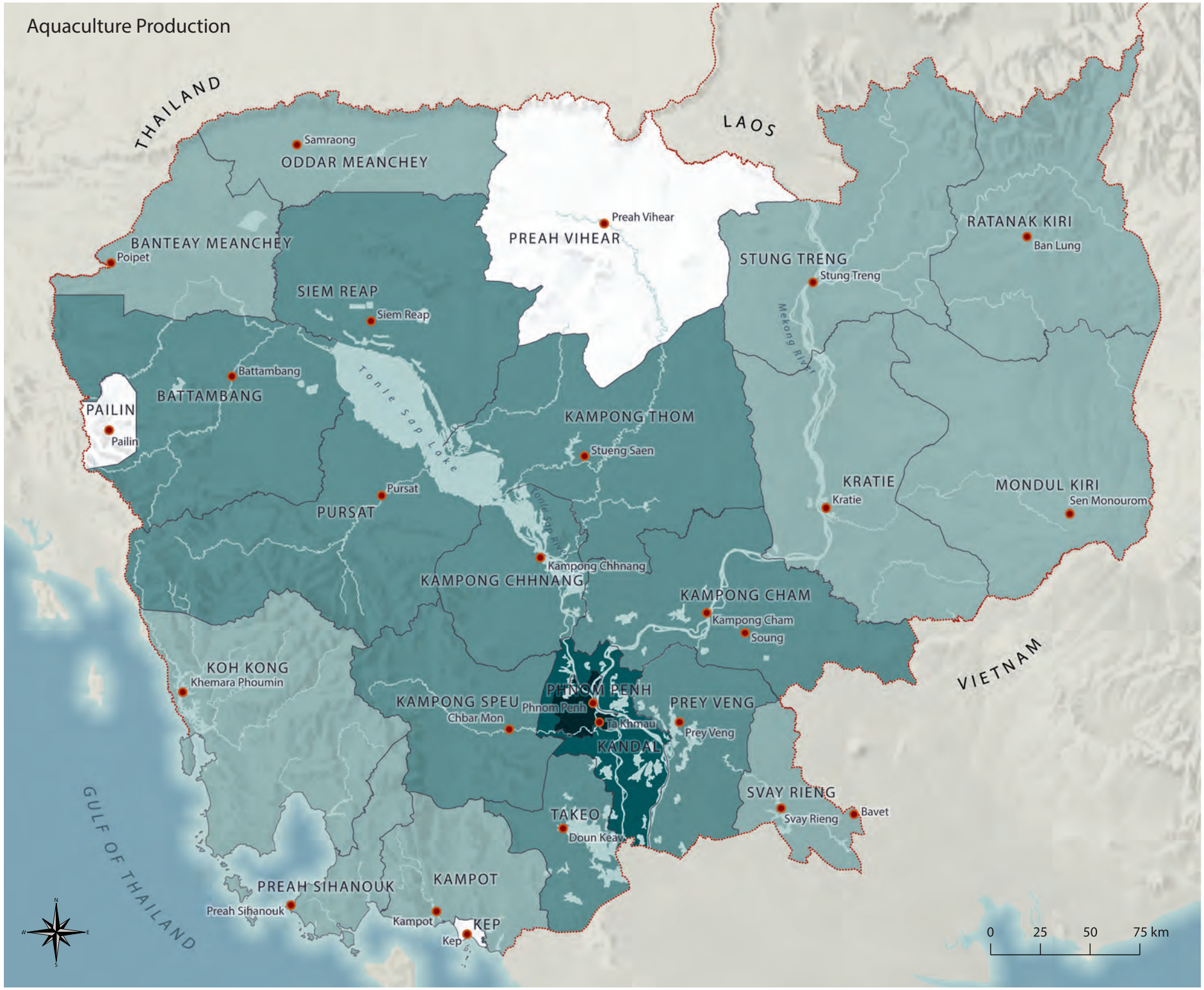


Growth of the aquaculture sector between 2001 qnd 2011. Source: FiA 2002-2012



Components of the Aquaculture sector. Source: FiA 2002-2012

Aquaculture Production



LEGEND

- Krong (City)
- International boundary
- Province boundary
- Water body

Aquaculture production in 2011 (tonnes)

- 15000 - 18000
- 10000 - 15000
- 7500 - 10000
- 2500 - 7500
- <= 2500
- No data

Data Source:
Fisheries Administration, 2011
http://arunatechnology.com
(Aruna Technology Ltd.)
Department of Geography (DoG), 2005

MANAGEMENT OF FISHERIES RESOURCES

The management of fisheries resources in Cambodia is now largely devolved to Community Fisheries (CFis). Community Fisheries based management officially commenced in late 2000 after the Royal Government of Cambodia (RGC) announced a broad reform of the fishing sector. The government decided to reduce the area of commercial fishing lots by 56 %, which represents more than half a million hectares, and transferred the decommissioned areas to small-scale local fishers that were subsequently organized into Community Fisheries with the help of the Department of Fisheries (now Fisheries Administration).

In 2012, the RGC fully abolished all fishing lots throughout the country. Some of the newly decommissioned lots were transferred to Community Fisheries and some became fishery conservation zones. In total, the RGC has transferred more than 1 million hectares of private concessions to Community Fisheries. This reform of the lot system that had existed for hundreds of years and the creation of small-scale community fisheries was an historic landmark for freshwater resources management in Cambodia, representing a shift in the paradigm from centralism and private ownership to decentralization and community-based management. By 2013 516 Community Fisheries had been established, of which 358 were officially registered by the Ministry of Agriculture, Forestry and Fisheries.

Despite significant achievements, Community Fisheries are faced with significant challenges. Experience shows that these structures can function well with support from external organizations or donors, but without such support they are prone to failing. This can be attributed to several factors, including, i) the limited capacity of CFis members, ii) the lack of a proper source of income for CFi committees to carry out their activities, and iii) the lack of personal incentives for CFi members to actively participate in management activities.

Despite remaining challenges, the government has made significant progress in supporting Community Fisheries. This includes formulation of policies and of a regulatory framework, institution setting, human resource development and capacity building, as well as stock enhancement (in particular through conservation zones and crab bank initiatives run by Community Fisheries), and the implementation of an alternative livelihoods program. Cambodia is now in a lead position to experiment and ultimately achieve sustainable management of fisheries resources by small scale fishermen through Community Fisheries.

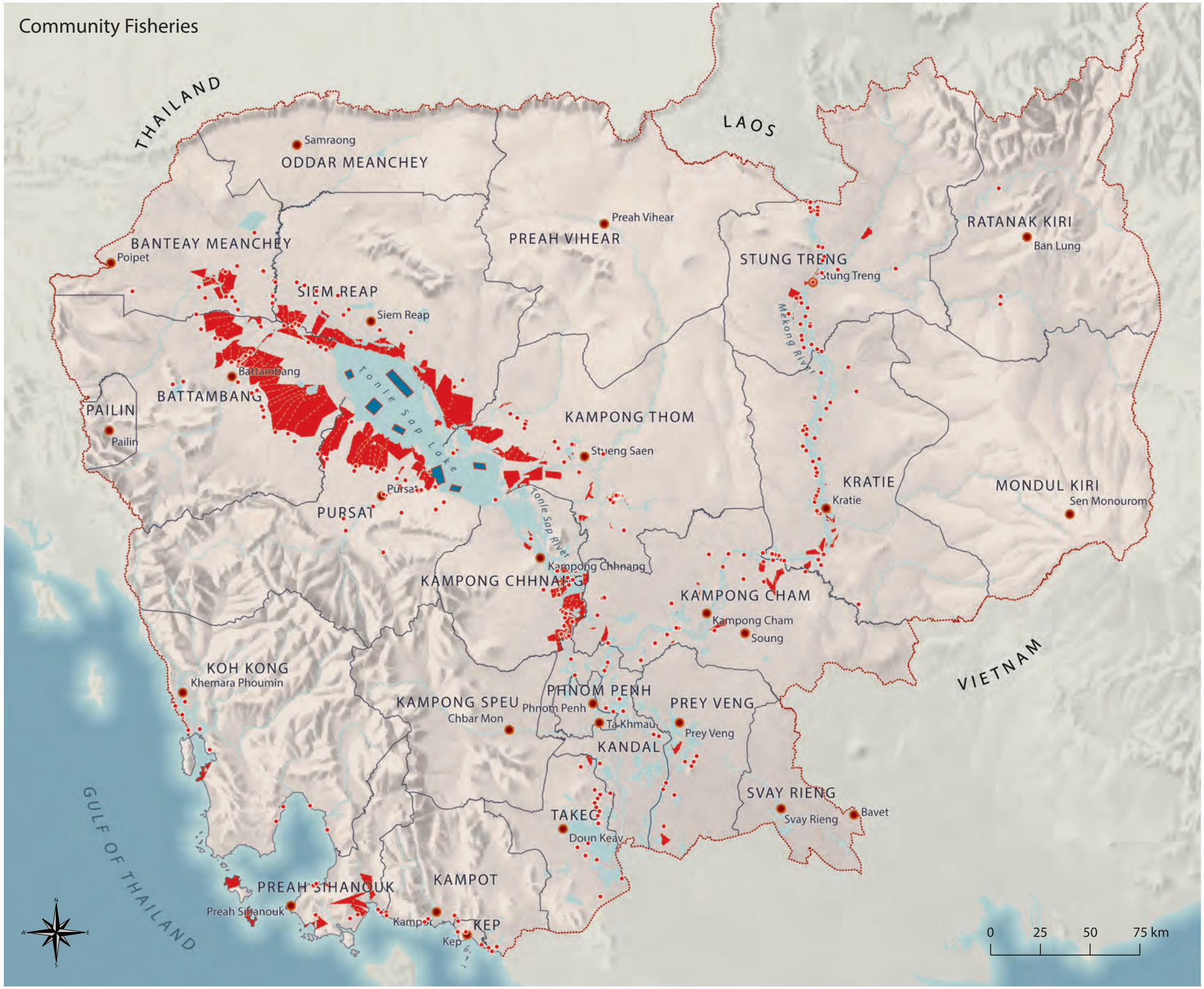
Photo by Eric Baran

FISH REFUGES AS A FISHERY MANAGEMENT TOOL

Fish refuges have been promoted as an essential way to manage fish resources, which has resulted in several complementary systems:

- Eight Tonle Sap fish sanctuaries were created in the 1980's and located in the open water part of the lake; their area ranges between 1000 and 6300 ha
- Fifty small scale protected areas were created in 2012 following the abolishment of fishing lots
- 358 Community Fishery conservation zones corresponding to ponds and wetlands were created around the country
- 764 commune fish refuges have been created to date; these community fish refuges combine fishing access regulation and aquaculture enhancement techniques based on stocking; their number keeps growing, with the target being at least one fish refuge in each of the 1,621 communes of the country
- Marine protected areas under the jurisdiction of the Ministry of Environment in the coastal zone

Community Fisheries



LEGEND

- Krong (City)
- International boundary
- Province boundary
- Water body
- Fish sanctuary

Community fisheries in 2011

- Community fishery with coordinates
- Community fisheries

Data Source:
Fisheries Administration, 2013
http://arunatechnology.com
(Aruna Technology Ltd.)
Department of Geography (DoG), 2005
Only some of the Cfi sites have complete information, showing coordinates. Not available for all sites so shown on the map as points.

Endnotes

[1] Considered here is the 2001-2011 period: 2001 follows the first fisheries reform, while 2012 is the year of the second reform, which marked the end of detailed catch monitoring based on commercial fisheries.

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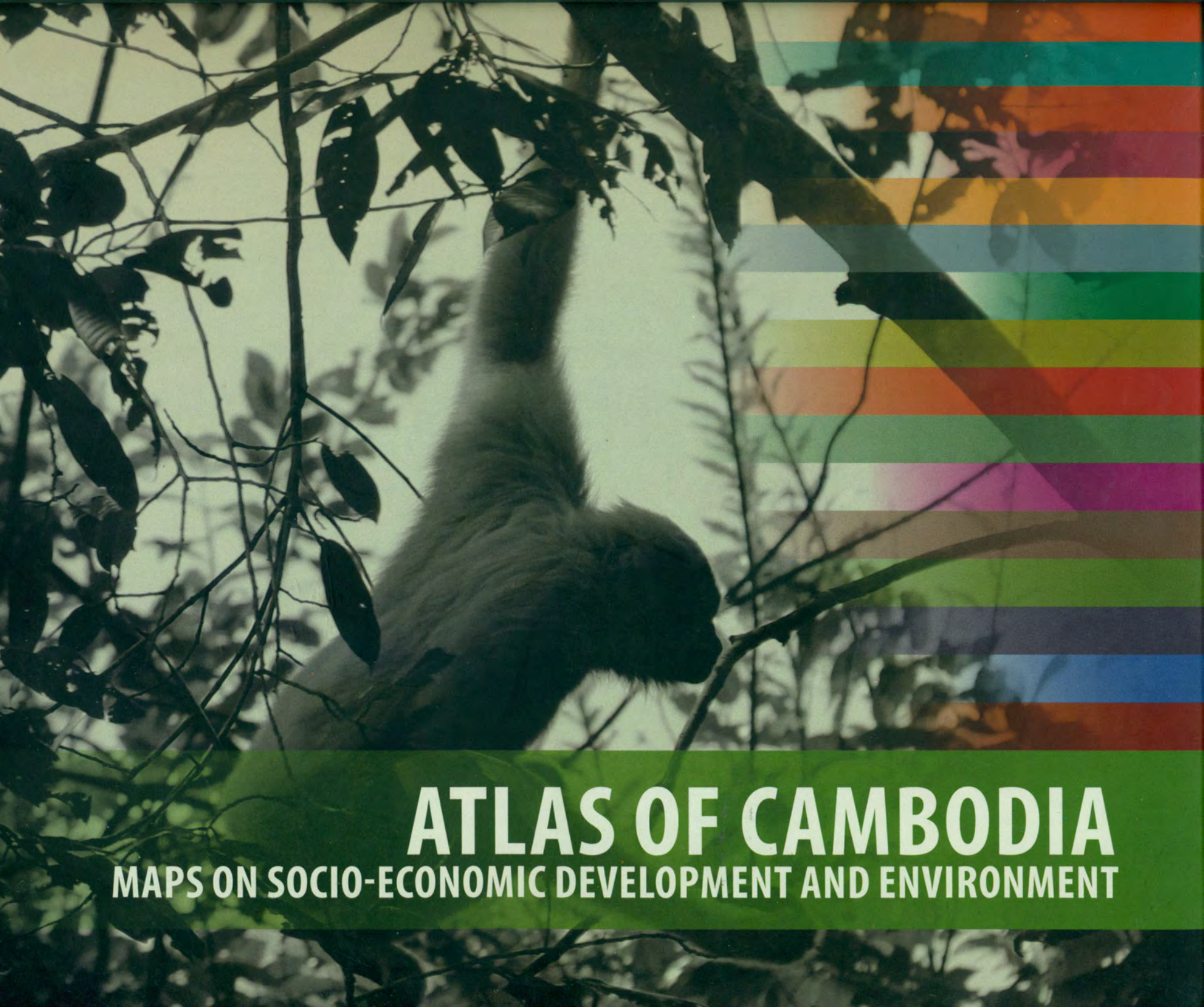

ATLAS OF CAMBODIA

MAPS ON SOCIO-ECONOMIC DEVELOPMENT AND ENVIRONMENT

1 Overview

Authors

BROD Sina, Technical Advisor Public Relations and Fundraising, Save Cambodia's Wildlife

SANDOVAL Rebeca, Atlas Project Coordinator-Consultant, Save Cambodia's Wildlife

2 Forests

Authors

BURTON Wayne, Chief Executive Officer Grandis Timber Limited, Cambodia

CHEA Lily , Forest Right Project Coordinator, The NGO Forum on Cambodia

CONLU Tanya, Conservation and Resource Management Coordinator, NTFP-EP, Cambodia

CUTTER Peter, Manager, Landscape Conservation Programme, WWF-Greater Mekong, Thailand

LAKHENA Chan, Program Officer, NTFP-EP, Cambodia

LEWIS Sophie Rose, Program Associate, RECOFTC, Cambodia

OLDENBURG Christoph, Advisor to the Land and Livelihoods Programme, The NGO Forum on Cambodia

PINTO Femy, Cambodia Facilitator, NTFP-EP, Cambodia

SANDOVAL Rebeca, Atlas Project Coordinator-Consultant, Save Cambodia's Wildlife

Collaborators

DA Heng, Community Forestry Partnership Coordinator (CFPC), Recoftc, Cambodia

HOK Menghoin, Indigenous People Land Rights Project Coordinator, The NGO Forum on Cambodia

PAYUAN Edwin, Country Program Coordinator, Recoftc, Cambodia

PHANN Sithan, Land and Livelihoods Programme Manager, The NGO Forum on Cambodia

SLOTH Arvid, Special Advisor, Department for Geosciences and Natural Resource Management, University of Copenhagen

3 Biodiversity

Authors

ALLANIC Yoann, Consultant in Biodiversity

FUREY Neil, Research Advisor, University Capacity Building Project, Fauna and Flora International, Cambodia

HAN Sam, Manager of Cambodian Crocodile Conservation Project, Fauna and Flora International, Cambodia

JUNDT Silvia, Operations Manager, Fauna and Flora International, Cambodia

MAHOOD Simon, Technical Advisor, Tonle Sap Conservation Projects, Wildlife Conservation Society, Cambodia

NUTTALL Matt, Monitoring Advisor - Seima Protection Forest, Wildlife Conservation Society, Cambodia

OLSSON Annette, Scientific Technical Advisor, Moore Center for Science and Oceans, Conservation International, Cambodia

PARNELL Terry, Grassroots Networking and Advocacy Specialist, East West Management Institute, Program for Rights and Justice, Cambodia

RUIZ FUENTE Nerea, Project Coordinator Natural Sciences Unit UNESCO, Phnom Penh

SANDOVAL Rebeca, Atlas Project Coordinator-Consultant, Save Cambodia's Wildlife

SCOTSON Lorraine, Research Associate, Free the Bears, Cambodia

THY Neang, CECG Manager, Fauna and Flora International, Cambodia

Collaborators

CLEMENTS Tom, Director, Wildlife Conservation Society, Cambodia Program

DIMENT Alex, Senior Technical Advisor, Wildlife Conservation Society, Cambodia Program

HUY Keavuth, Senior GIS / Remote Sensing and Database Officer, WWF Cambodia

LEDEQC Thibault, WWF Conservation Programme Manager, WWF Cambodia

MULLIGAN Berry, Project Manager, Fauna and Flora International, Cambodia

OWEN Michelle, Acting Country Director, WWF Cambodia

SENG Bunra, Country Director, Conservation International, Cambodia

4 Fish Resources

Authors

BARAN Eric, Senior scientist, WorldFish

CHHENG Phen, Acting director, Inland Fisheries Research and Development Institute

LY Vuthy, Deputy Director, Department of Community Fisheries Development, Fisheries Administration

NASIELSKI Joshua, Research consultant, WorldFish

SARAY Samadee, Research officer, WorldFish

TOUCH Bunthang, Nutrition scientist, Inland Fisheries Research and Development Institute

TRESS John, GIS consultant, WorldFish

Collaborators

KAING Khim: Deputy Director, Fisheries Administration

TAN Sokhom, Research officer, WorldFish

5 Climate

Author

BREWSTER Julien, REDD+ M&E Advisor, PACT

NILSSON Johannes, Communication amd Climate Change Project Officer, Forum Syd, Cambodia

SANDOVAL Rebeca, Atlas Project Coordinator-Consultant, Save Cambodia's Wildlife

Collaborators

BROD Sina, Technical Advisor Public Relations and Fundraising, Save Cambodia's Wildlife

6 Health

Authors

HUERTA Ulises, Public Health Researcher

MCLENNAN Lyn, Country Program Manager, WaterSHED

SHANTZ Andrew, Freelance Consultant

SIV Sovannarothm, Chief of Technical Bureau, Chief of Vector Control Unit, National Center for Parasitology, Entomology and Malaria Control

Collaborators

KOV Phyrum, Country Coordinator, Water and Sanitation Program, Cambodia

PUV Sophea, Monitoring Coordinator, WaterSHED

Collaborators

BURJA Kurt, World Food Program, Cambodia

CHOEUR Chanvibol, World Food Program, Cambodia

7 Education

Authors

LONN Pichdara, Researcher, Cambodia Development Resources Institute

NIEVELER Anja, Communication and Research, Aide et Action

Collaborators

DE VRIES Peter, Chief Education Section, United Nations Children's Fund, Cambodia

15 Agriculture

Authors

BREDEHÖFT Claudius, National Project Coordinator Cambodia, ASEAN Sustainable Agrifood Systems (Biocontrol)

BROD Sina, Technical Advisor Public Relations and Fundraising, Save Cambodia's Wildlife

FINK Christian, Technical Advisor Organic Farming and Certification, CEDAC

NOU Sothea Keo, Program Coordinator, CDRI

STÖGER Adrian, Technical Advisor Microfinance, CEDAC

Collaborators

SAM Vitou, Program Director Local Development Program, CEDAC

16 Economic Development

Authors

BROD Sina, Technical Advisor Public Relations and Fundraising, Save Cambodia's Wildlife

LAMPELL Zachery, Consulting Editor, Open Development Cambodia

SANDOVAL Rebeca, Atlas Project Coordinator-Consultant, Save Cambodia's Wildlife

Collaborators

LANGER Bernhard, Consultant and Freelance Journalist

17 Tourism

Authors

BROD Sina, Technical Advisor Public Relations and Fundraising, Save Cambodia's Wildlife

SANDOVAL Rebeca, Atlas Project Coordinator-Consultant, Save Cambodia's Wildlife

SOK Sophea, Executive Director of Cambodia Community Based Ecotourism Network

18 Energy

Authors

BUYSMAN Eric, Pro-poor Biodigester Technology Advisor, SNV Netherlands Development Organisation

CHAUMONT Thomas, Private Sector Engagement and M&E Coordinator, GERES, Cambodia

JOYA Romain, Forestry & Biomass energy Research Officer,GERES, Cambodia

PERGETTI Silvia, Knowledge Management Coordinator, GERES, Cambodia

RUILETT Mathieu, Country Director, GERES, Cambodia

STEELE, Jason, Sector leader Renewable Energy, SNV Netherlands Development Organisation

Collaborators

JONA Victor, Ministry of Mines and Energy, Cambodia

NGOV-VENG Chheng, M&E Specialist and Carbon Finance Analyst, GERES, Cambodia

PREY Sovann, GIS and Database Specialist, GERES, Cambodia

Advisor team

DIEPART Jean Christophe, Scientific Collaborator, Gembloux Agro-Bio Tech, University of Liège (Belgium)

EVERSMANN Bernd, Advisor GIS and Land Management, Royal University of Agriculture (GIZ-CIM) GIZ, Cambodia

GAGER Paul, Technical director, Aruna Technology, Ltd.

SYMANN Ralf, Coordinator Land Management, GIZ, Cambodia

THOMAS Ian, GIS Consultant, Mekong Consultant Co., Ltd.

Peer Reviewers

DIEPART Jean Christophe, Scientific Collaborator, Gembloux Agro-Bio Tech, University of Liège (Belgium)

EVERSMANN Bernd, Advisor GIS and Land Management, Royal University of Agriculture (GIZ-CIM)GIZ, Cambodia

SYMANN Ralf, Land Rights Programme Coordinator, GIZ, Cambodia

Other Contributors

LIM Saky, Local Governance Programme Officer, United Nations Population Fund, Cambodia

YI Soktha, Population and Development Programme Analyst, United Nations Population Fund, Cambodia

Arief Anshory Yusuf, Director, Center for Economics and Development Studies, Universitas Padjadjaran, Indonesia

Atlas Team

SANDOVAL Rebeca, Atlas Project Coordinator-Consultant, Save Cambodia's Wildlife

NHIEP Seila, GIS Expert

PHLONG Leng, Short Term- GIS Assistant

TAL Makara, Short-Term Project Assistant

BROD Sina, Technical Advisor Public Relations and Fundraising, Save Cambodia's Wildlife

SCHMUTZLER Christine, Graphic Designer

LAVENDER Greg, Peer Reviewer

HILLMANN Cornel, Animation Media Designer

MICHAUD Allan, Script and Film Making Consultant

ALLANIC Yoann, Short-Term Volunteer

SCW Head Office Support Staff

TEP Boonny, Executive Director

LOEUNG Sokkhana, Senior Finance and Admin Officer

KANG Sophea, Finance Assistant

LENG Sarorn, Information, Education, Communication Officer

LUN Bona, Information, Education, Communication Assistant

NIEVELER Anja, Short-Term Volunteer, Save Cambodia's Wildlife

PAPADIMITRIOU, Andre, VSO Business Advisor, Save Cambodia's Wildlife

WESSLING Lukas, Long-Term Volunteer, Save Cambodia's Wildlife