

Planning Concepts for Revised Mekong Delta Regional Plan 2030 & Vision 2050

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**Mekong Delta Region Vision 2050:
Accentuating, Differentiating & Intensifying
Six Agro-ecological Regions**

**Planning Concepts for Revised
Mekong Delta Regional Plan 2030 & Vision 2050**

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PREFACE

Planning concepts of Revised Mekong Regional Plan 2030 & Vision 2050

The Mekong Delta requires urgent attention. Due to its geography and geology, it is predicted to be one of the most severely affected deltas in the world by the adverse impacts of climate change: sea level rise, saline intrusion and as well unstable water flows of the mighty Mekong River due to ever-increasing trans-boundary developments upstream. Simultaneously, the Mekong Delta is going through a dynamic period of very intense transformation, both in its urban and rural areas. Both dimensions — climate change and intense transformation — necessitate an adequate response from the government. Spatial planning holds one of the key responsibilities to formulate and implement this response. This report attempts to formulate spatial planning concepts for this and translates them into the format of a regional plan.

This report is submitted to the Vietnamese Ministry of Construction by the international expert team directed and coordinated by RUA in fulfillment of the requirements of the second stage of the project according to the terms of reference for the 'Planning Concepts of the Revised Mekong Delta Regional Plan 2030 and Vision 2050'. The report complements a parallel report by the Southern Institute of Spatial Planning (SISP) in Ho Chi Minh City.

The planning area of the project is the Vietnamese component of the Mekong Delta, which totals 40,604.7km². It is referred to as the Mekong Delta Region (MDR) and includes the administrative boundary of Cantho city and 12 provinces: Long An, Tien Giang, Ben Tre, Dong Thap, Vinh Long, Tra Vinh, Hau Giang, An Giang, Soc Trang, Kien Giang, Bac Lieu and Ca Mau. In 2014, the MDR accommodated 17.51 million people (General Statistics Office 2015:20). It shares 300 km of border with Cambodia, has more than 700 km of coastline and includes approximately 360,000 km² of territorial sea.

The RUA team and partners have developed a critical contextual approach (to urban planning and to the terms of reference of the assigned contract). Through a dialectal process and the confrontation between the existing context and contemporary issues,, visions for the Mekong Delta Region's future were created as a synthesis with evident and feasible solutions for its sustainable development. This iterative process between context analysis and vision formulation has focused on two intertwined tracks:

- 1] a precise problem formulation that is answered by six general visions that have then been translated into a sharp definition of spatial development concepts;
- 2] the elaboration of new climate adaptive and productive landscape typologies based on the existing agro-ecological qualities of the territory that are grounded in its geography and geology and new urban morphologies, territorial organizations and infrastructural devices that can be effectively realized within revisions of the Cantho and the 12 provincial masterplans and are consistent with and realize the vision and the strong foundation of sustainability, namely the 'triple bottom line' of the social, environmental and economics conditions unique to changing conditions of the Mekong Delta Region. As well, the institutional conditions (opportunities and constraints) in the Vietnamese context are heeded and adapted to in the recognition, recovering and emphasizing of the articulation in determination of new dispersed centralities and processes of implementation.

More specifically, the RUA methodology involved extensive regional planning data collection. This allowed for a historic and contemporary (interpretative) reading of the territory through maps, plans, master plans, studies and statistics of various kinds, regional / urban projects, agricultural programs and aqua-cultural processes, historical and contemporary surveys of the region, urban areas as well of their rural hinterlands, nature reserves and other areas of ecological importance, etc. RUA collected and analyzed a an elaborate set of documents (local, regional and national urban policy documents of various kinds, studies on implementation of economic zones, delimitation of the agricultural zones, tourism development, national defense and security, etc.) complemented this with thorough fieldwork throughout the delta and meetings with structured questioning of relevant departments, institutes and various organizations with an important stake in the region's spatial future. The regional analysis was primarily formatted into a critical spatial analysis based on the above-mentioned data through, amongst others: territorial analysis, detection and evaluation of landscape transformation processes, an impact analysis of ongoing processes of industrialization in or outside economic zones, tourism development, agricultural innovation, etc., an understanding of the relationships between settlements, towns and cities and their various systems (transport, trade and economy, services, etc.). A series of layered, interpretative maps were developed to understand the various relationships of geography, geology and man's imposed networks on the MDR.

Since regional planning does not have a specific governing mandate in the Vietnamese planning system, there has been particular attention paid to the nature and to the feasibility of a regional plan for the Mekong Delta. Although the terms of reference begin from the premise of revising the 2009 plan for the Mekong Delta Region, the RUA team also spent a significant amount of time analyzing the approved plans of Cantho and the 12 provinces. When all these plans are collectively assembled, they indeed also comprise of a Mekong Delta Plan (that is not coherent with the 2009 Mekong Delta Region Plan). The revised MDR plan to 2030 and vision to 2050 was consequently developed in relation to strengthening the existing qualities (of reality), but as well in relation with the projections and possibilities of Cantho and the 12 provinces.

Development objectives carefully consider the MDR's national and international role and regional development and are based on sustainable development strategies, green growth and, last but not least, climate change adaptation, a major challenge that indeed cannot be avoided. The plan is developed with regional spatial development orientations to 2030 and a vision to 2050. It is evident that climate change challenges require forward-thinking that strives even more into the future with regards to building resilient landscapes, sustainable infrastructure systems and urban morphologies that can adapt to the rapidly changing conditions as the MDR will see inundation, saline intrusion, and new ecologies pervade the territory. These imminent challenges are an opportunity for the MDR to create new forms of living in a delta, living with a delta. When development is anchored upon the natural resources — the main asset of the MDR — then these new forms of life will inevitably also accentuate,, further differentiate and intensify its six agro-ecological regions. A new water urbanism is in the making in the MDR

This second stage report is presented to the Ministry of Construction for its approval and suggestions to improve and eventually correct it. The third stage of the project will include the presentation of the proposed revised plan to Cantho and the 12 provinces to discuss its concepts, highlight the advantages of regional logics as opposed to fragmented provincial development and to receive feedback from the city and provincial governments. Critical comments will be integrated into an edited report and drawings will be revised as necessary. Finally, one comprehensive report will be made that encompasses that with the one prepared by SISP. This final report will be presented again to the Ministry of Construction and as well the National Assessment Committee.

MEKONG DELTA REGIONAL PLAN VISION 2050

1 RECOGNITION THAT WATER + AGRI- & AQUACULTURE = MDR

Water is by definition the DNA of the MDR & sustainable water management is essential for sustainable development of the MDR

This includes the systematic improvement, extension, adaption and modernisation of water infrastructures such as waterways, fresh water distribution, irrigation and drainage, water storage, containment of saline intrusion & water purification facilities.

An agri- & aquacultural region by nature

The interplay of water and soil generates the extra-ordinary fertility of the MDR. This is the main asset of the MDR. Its natural, and consequentially evident and sustainable destiny is that of a region, concentrating on and specialised in agri- and aquaculture and marine economies.

2 NEED TO BALANCE BETWEEN ECONOMY & ECOLOGY

Re-establish a balance between economy and ecology

The sustainable development of the MDR requires the re-establishment of a balance between economic exploitation of natural resources and ecological integrity.

Creation of a new economy which balances monocultures and special products

A substitution of (low value) monocultures that erode the environmental qualities with new (high value) special species that can be embedded in the rich ecology of the MDR is not only necessary to avoid an unavoidable environmental crisis, but also to diversify the economy (that will consequently gain robustness).

3 LOCAL PROCESSING OF AGRI-, AQUACULTURE & FORESTRY PRODUCTS

Local processing of agri-, aquaculture & forestry products

This diversification makes the economy of the MDR more robust. Enhancing local processing of the agro- and aqua-cultural produce of the MDR generates an endogenous process of industrialisation in sectors where it has competitive advantages to other regions in Vietnam (nearby-ness, local knowledge, tradition, etc.). A larger part of the value chain would therefore remain in the MDR

Optimal agro-eco regional development

Smart sustainable development means anchoring development on the specific environmental characteristics of the agro-ecological regions within the MDR.

4 CLIMATE CHANGE AS A THREAT & AN OPPORTUNITY

Address climate change on systemic level

As has become tradition in the MDR, it is good policy to rather work with the forces of nature (inundations, monsoons, droughts, salination, etc.) rather than to try to impose on nature.

Protection and safety with natural means

a policy shift from hard-engineering (dykes, etc.) towards natural means (systemic afforestation, regeneration and extension of mangroves, etc.) simultaneously restores ecologies & generates opportunities to embed new sustainable economies (sustainable shrimp farming within mangroves, medicinal plants in forests, etc.)

5 SUSTAINABLE DEVELOPMENT

Limit land consumption

Urban development and industrial areas must to be reoriented to **stop further unnecessary consumption of the most valuable asset of the region: productive landscapes**. Cities must begin **densification** rather than further extension.

Accept out-migration

The MDR has experienced for quite some time **important out-migration** (amongst others to the economic magnet Ho Chi Minh City). This is **not dramatic**, but rather natural. The MDR economically develops as far as the balance of ecology and economy allows and in this way safeguards its future (and Vietnam's food security)

6 INFRASTRUCTURE DEVELOPMENT TAILORED TO SPECIFITIES OF MDR

Strategic infrastructure provision

Much more than in most contexts worldwide, infrastructure is very expensive. It is wise to shift the transport policy from a general and equal covering of the territory with infrastructure to a strategic choices (for the most effective/ efficient ones to begin with)

Shift investment from roads to waterways

Waterways have been the natural mode of transport in the MDR for centuries. They still today are the most appropriate mode of transportation for agricultural mass produce.

Analysis & Evaluation of Existing MDR Demographics

Dr. Michael Waibel – Department of Geography – Hamburg University, Germany

In terms of demographics, the Mekong Delta Region is a very interesting case study. In the past, the overall population growth within this area has been considerably lower compared to the national average of Vietnam. The main reason for this is that the Mekong Delta—mostly governed by agricultural activities—has a long tradition of out-migration. The main target area of the migration flows is the economic hub of Ho Chi Minh City and the surrounding provinces where there are abundant labor opportunities, among other at the export processing zones and industrial parks with a high demand of unskilled labor. Further, the services sector of Ho Chi Minh City, particularly the whole gastronomy—hospitality—and tourism sector is widely maintained by migrants from the Mekong Delta. Last but not least, there are many renowned institutions of higher education, which attract particularly young people.

In terms of demographics two components are decisive: 1) The natural population development which can be described by indicators such as (total) fertility rate (basically the average number of children that would be born to a woman over her lifetime), crude birth rate, crude death rate and finally natural increase rate (crude birth rate minus the crude death rate of a population) and 2) The migration development which can be described by in-migration rate, out-migration rate and finally net migration rate (the difference between the number of persons entering and leaving an administrative unit during the year).

An in-depth analysis of the population development in the past within the various provinces of the Mekong Delta reveals a spatially heterogeneous and complex picture. There are provinces, which show relatively

high population increases and provinces where the population figures are rather stagnant. There are provinces with high crude birth rates and provinces with low crude birth rates. The same goes for migration patterns. In this respect the author is well aware of the common practice of under-reporting mortality and births in Vietnam, which has been shown by several studies before. However it is assumed that this is happening to a similar extent all across the Mekong Delta Region, which leads to comparable regional disparities in terms of demographics.

Further, the gender dimension of migration has to be highlighted. Several studies have shown that the number of female migrants is significantly larger than of male migrants. In the case of rural-urban migration, for example, there are 43.5% male migrants versus 56.5% female migrants—if you look at the whole of Vietnam (MPI /GSO 2013). The intensive migration of population in reproductive ages (the most common age group of the migrants is between 20-29 years) has tremendous effect on the total fertility rate and the crude birth rates of the Mekong Delta Region provinces, as well. In fact, the Mekong Delta Region exhibits the lowest birth rates of the whole of Vietnam.

The figures and maps shown in this chapter illustrate and explain demographic trends mainly based on the analysis of data from the General Statistical Office of Vietnam. To do a more in-depth research this should be complemented by the analysis of further statistical data and by semi-structured interviews with local experts. This shall provide more valid information about unexpected anomalies of the quantitative data and about more qualitative factors such as values, norms and lifestyles of a population that is rapidly changing in terms of living standards but that

is also witnessing increasing environmental stress due to the effects of climate change and unsustainable land use, for example.

The following graphs and maps illustrate the population development within the Mekong Delta region in the course of the past 20 years. Data for this were extracted from various issues of the Vietnam National Statistical Yearbook. If you look at first at the whole population development of the Mekong Delta you observe that it increased by 10.3% from 1994-2013. In absolute figures this is an increase from 15.84 million people to 17.48 million people (fig. 1). This increase is far below that of the whole country of Vietnam in the same period of time. On national level a total increase of 23.7% (from 72.51 million till 89.71 million people) could be observed. As mentioned above the main reason for this is massive out-migration. Many of those migrants are young women at the potential age of giving birth. This is also leading to under-average natural population increase rates within the Mekong Delta because those women are lacking within the age pyramids.

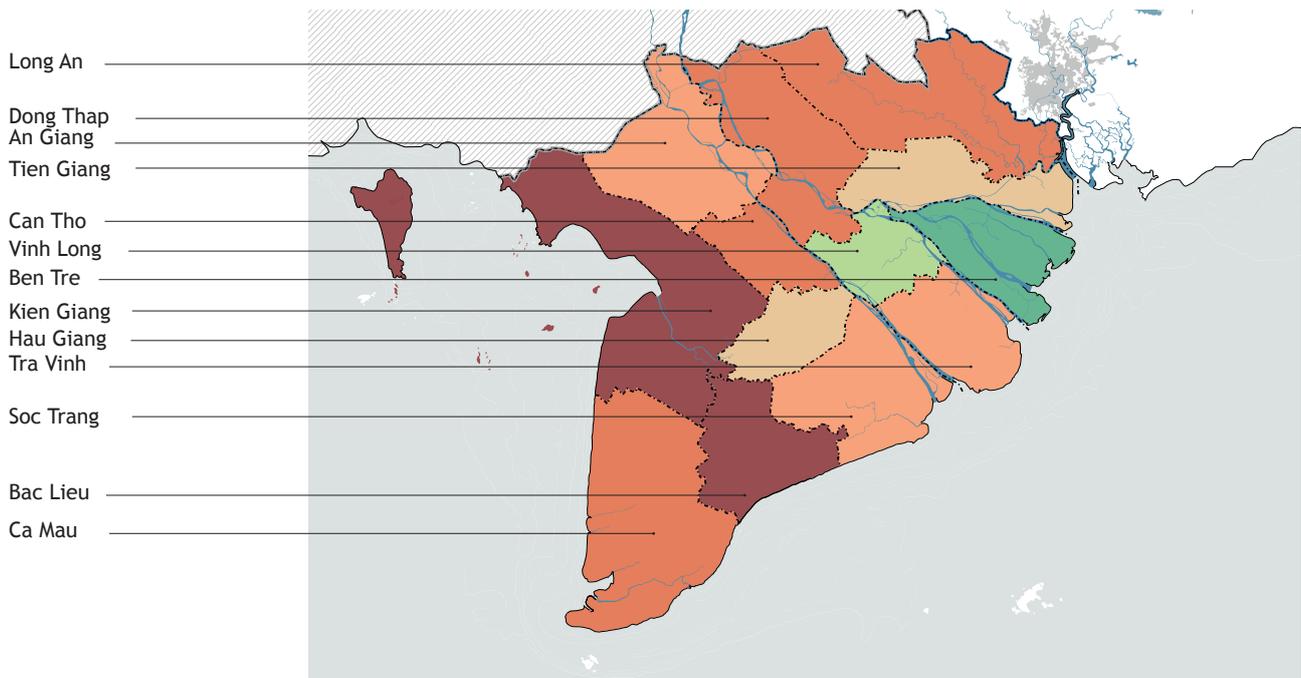
Having a closer look at the provincial level you observe regionally contrasting developments. There are provinces with have seen a population decrease in the past 20 years such as Ben Tre (-5.1%) and Vinh Long (-2.0%), but there are also provinces with population increases which are the same or even higher than national average such as Kien Giang (27.9%) and Ba Lieu (23.6%).

Particularly the case of Ben Tre is interesting. Probably its proximity to the economic hub of Ho Chi Minh City (small movement distance) is facilitating the decision for migration because it allows also for circular migration patterns or at least for frequent visits at home.

The relative high population increase in the more remote areas of the Mekong Delta is not surprising, neither. Those areas are economically less developed and the spatial distance of target regions such as Ho Chi Minh City is comparatively high. Nevertheless, those areas are important regions of out-migration, particularly in more recent time as will be shown in the course of this chapter.

Kien Giang is a special case though because it incorporates the island of Phu Quoc scenically located in the Gulf of Thailand. It shall be developed into a major international tourist hub and significant national economic growth pole. This will certainly lead to significant in-migration at local scale. If you will look at the average figures of the Kien Giang province only, the adverse effects of in-migration (e.g. to Phu Quoc) and out-migration (e.g. to Greater HCMC) from other parts of the province may lead to a blurred picture. This specific context should be kept in mind when doing further analysis.

Looking at fig. 1, there are two anomalies, which can only be explained through changes in the methodology of statistical compilation. Between 2002 and 2003 there is a sudden and unexpected increase of population numbers among almost all provinces of the MDR whereas from the year 2006 till the year 2007 there is an unexpected decrease in population. Probably the reason for this is some statistical re-classification and / or a change of statistical methodology. This issue needs to be further discussed with local experts. For this reason, the time lines of the maps showing the population development in the past have been adapted to time lines from 1994-2002, from 2003-2006 and from 2007-2013.



Map 1: Population Development of the Mekong River Delta Region from 1994-2013

- █ -10.0 till < -5.0 (Min: -5.1) Ø Mekong Delta: 10.3
- █ -5.0 till < 0.0 Ø Vietnam: 23.7
- █ 0.0 till < 2.5
- █ 2.5 till < 5.0
- █ 5.0 till < 10.0
- █ 10.0 till < 20.0
- █ 20.0 till < 30.0 (Max: 27.9)

Source: GSO Vietnam
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 Cartography: C. Carstens
 Design: M. Waibel

Remarks: Minh Hai Province was split into Bac Liêu Province and Ca Mau Province in 1996; Can Tho City was created in 2004 by a split of the former Can Tho Province into two new administrative units: Can Tho City and Hau Giang Province; Bac Lieu und Ca Mau: Data for 1995 instead of 1994; Can Tho and Hau Giang: Estimates from 1994-1999.

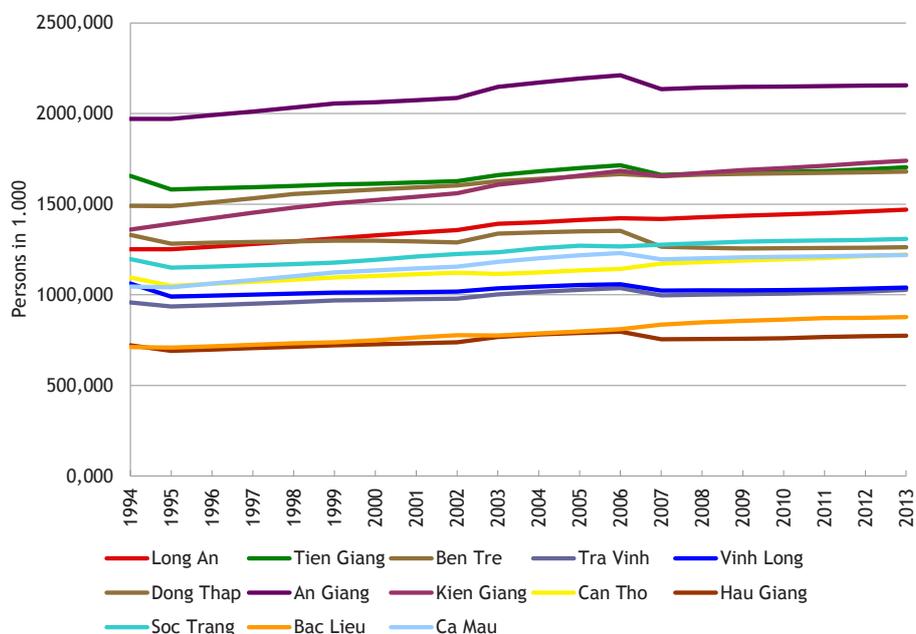
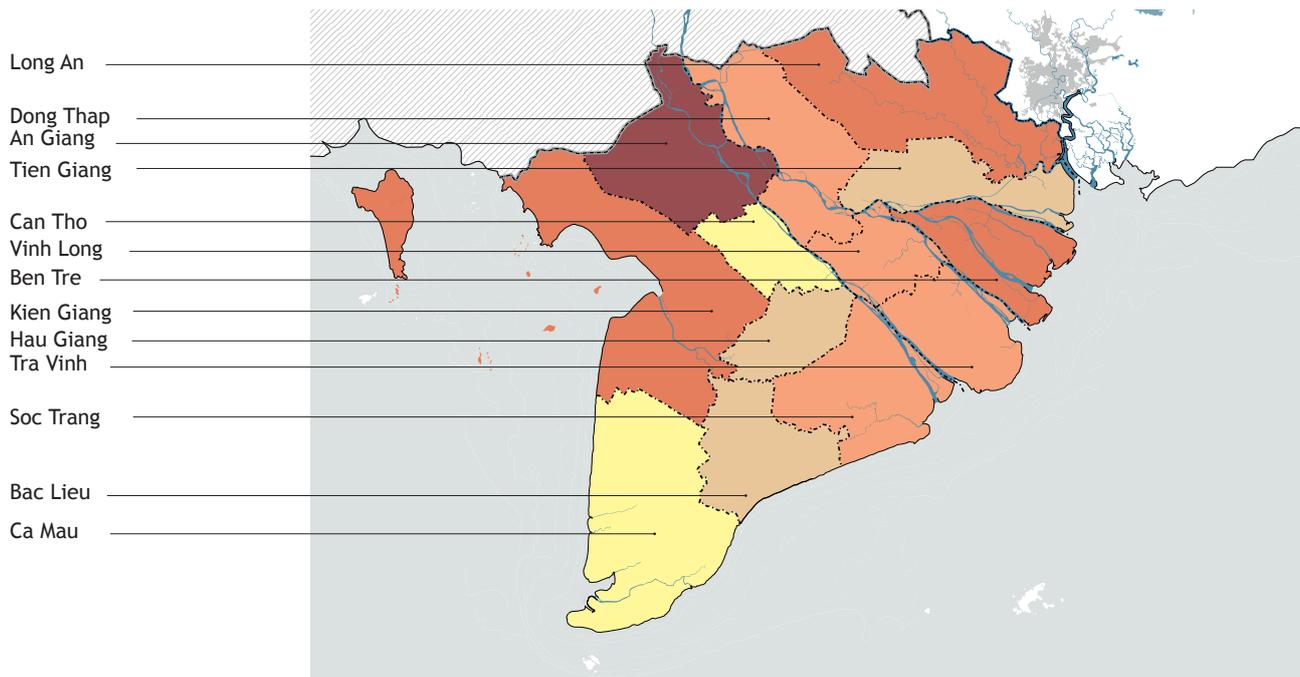
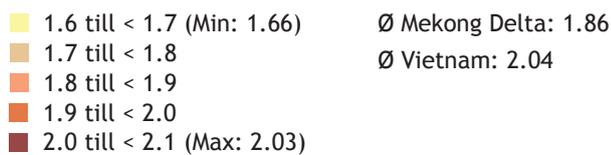


Figure 1: Population development of the Mekong River Delta Region, 1994-2013

Notes: Can Tho City as created in the beginning of 2004 by a split of the former Can Tho Province into two new administrative units: Can Tho City and Hau Giang Province (Can Tho and Hau Giang: Estimates from 1994-1999). Minh Hai Province was split into Bac Liêu Province and Cà Mau Province on November 6, 1996



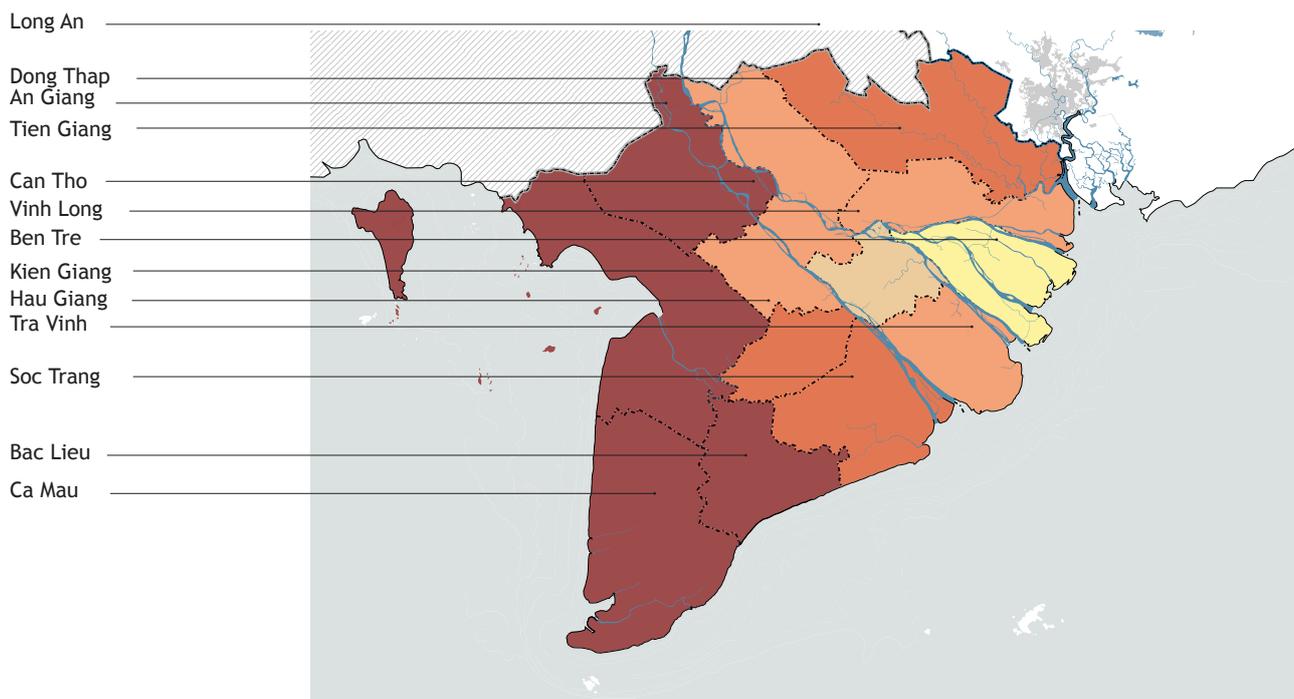
Map 2: Total fertility rate of the Mekong River Delta Region from 2010-2013



Source
GSO Vietnam

Total Fertility Rates

In regard of the total fertility rate (TFR) the average figure out of the years 2010-2013 has been calculated. This has been done to avoid single extreme values. The picture is evident, though: 12 out of 13 provinces of the Mekong Delta Region have a total fertility rate (TFR) under the replacement level of below 2.0 children per woman, only one, the An Giang Province shows a TFR around the replacement level. Only six other provinces in the whole of Vietnam, located in the Southeast and in the Red River Delta have a TFR under the replacement level, as well (MPI / GSO 2013).



Map 3: Crude Birth Rates of the Mekong River Delta Region from 2005-2013

- 13.0 till < 14.0 (Min: 13.8)
 - 14.0 till < 15.0
 - 15.0 till < 16.0
 - 16.0 till < 17.0
 - 17.0 till < 18.0 (Max: 17.9)
- Ø Mekong Delta: 16.0
Ø Vietnam: 17.2

Source
GSO Vietnam

Remarks: Note: Values for 2006 are interpolated; Estimates for 2013

Crude Birth Rates & Death Rates

Similar to the total fertility rate, there are also differences in the crude birth rate among the different regions of Vietnam. In general, the Mekong River Delta is the region with the lowest fertility throughout the country, standing at 15.3 live births per 1,000 persons in 2013 (MPI / GSO 2013). Within the Mekong Delta Region, the crude birth rates have decreased from 2005-2013. The strongest decline could be observed in Ca Mau Province. Ca Mau had the highest crude birth rate of all Mekong Delta Region provinces back in 2005. In 2013 it had the fourth-lowest crude birth rate. This was mainly due to massive out-migration as will be also shown in the further course of this chapter (MPI / GSO 2013).

With regards to maps No. 3-5, the average figure out of a span of 9 years (2005-2013) was calculated. This serves to avoid single extreme

values. The crude death rate is regarded as one of most simple and basic indicators, reflecting the mortality of a population. As mentioned above, the mortality information collected via the surveys is often under-reported as compared to that in reality (MPI / GSO 2013).

Within the Mekong Delta Region the crude birth rate is about on the same level as in the whole of Vietnam. Looking at the province level it shows an inconsistent and paradox picture at first sights. Relatively poor provinces like Cau Mau or Soc Trang exhibit low crude death rates even on the same level like Can Tho, the richest city within the Mekong Delta region. This has something to do with the intricate interplay of prevalent age and gender structures, life expectancy and health standards.

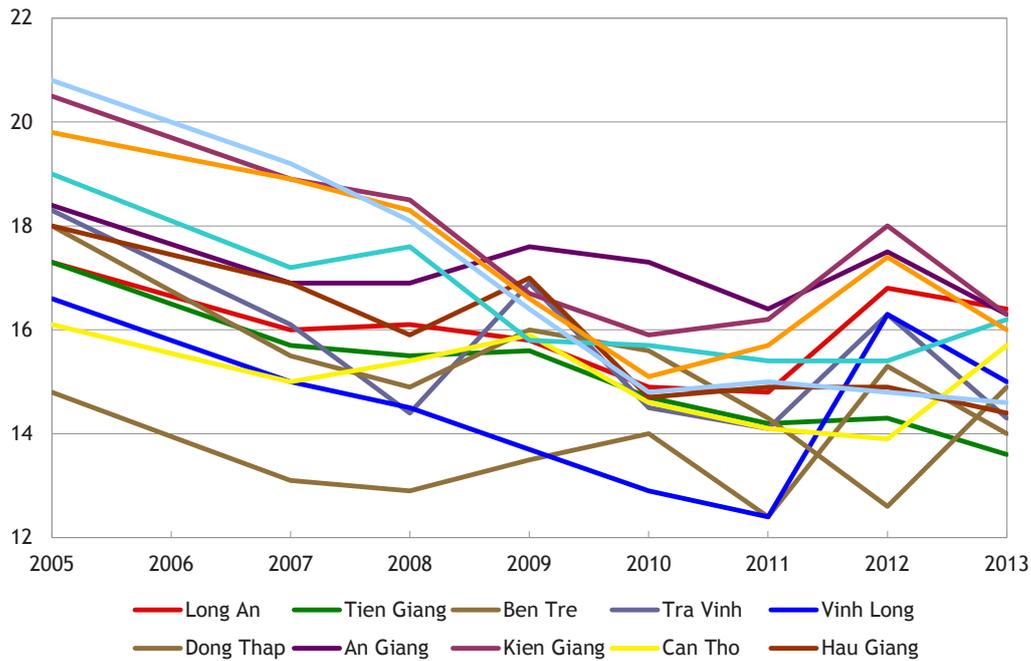
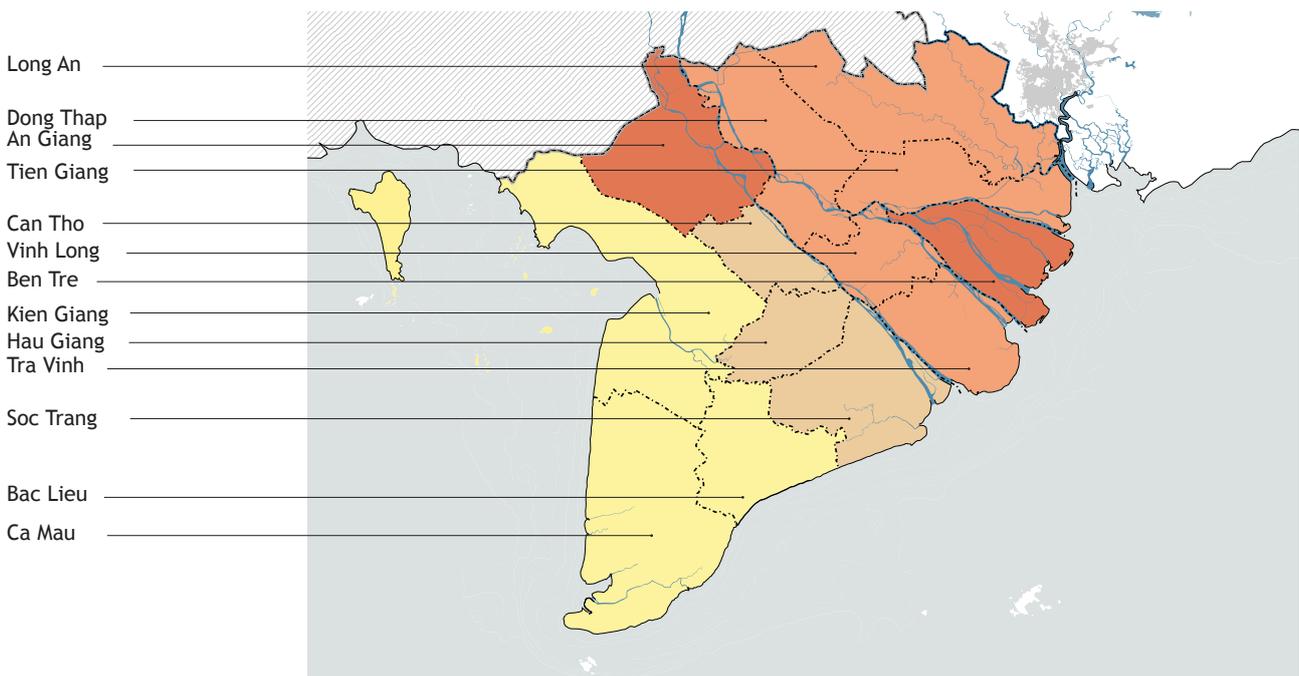


Figure 2: Crude Birth Rates of the Mekong River Delta Region from 2005-2013

Source: GSO Vietnam

Remarks: Note: Values for 2006 are interpolated; Estimates for 2013



Map 4: Crude Death Rates of the Mekong River Delta Region from 2005-2013

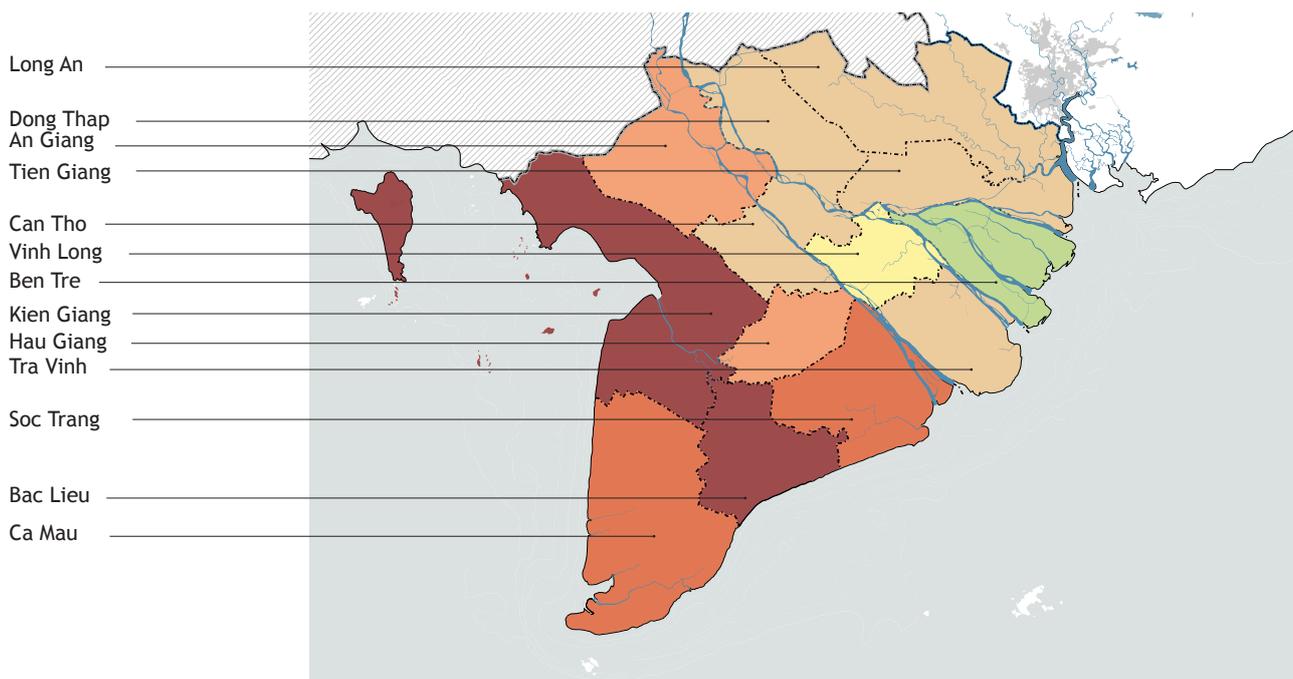
- 5.0 till < 5.5 (Min: 5.2)
- 5.5 till < 6.0
- 6.0 till < 6.5
- 6.5 till < 7.0 (Max: 6.6)

Ø Mekong Delta: 6.0
Ø Vietnam: 6.2



Source: GSO Vietnam
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Cartography: C. Carstens
Design: M. Waibel

Remarks: Data for 2006 are interpolated estimates done by the author; data for 2013 are estimates by GSO Vietnam.



Map 5: The rates of natural increase of the population of the Mekong River Delta Region from 2005-2013

Remarks: Data for 2006 are interpolated estimates done by the author; data for 2013 are estimates by GSO Vietnam.

Increase of Natural Population Rates

As mentioned above, the rate of natural increase is the crude birth rate minus the crude death rate of a population. Within the Mekong Delta Region this indicator shows significant regional disparities. Provinces such as Kien Giang (12.6 %), Bac Lieu (12.2 %), Ca Mau (11.9 %) or Soc Trang (11.0 %) have considerable higher natural increase rates than the provinces closer to the Ho Chi Minh Metropolitan Region.

The province with the lowest natural increase rate (7.2%) is Ben Tre, a long-established province of out-migration with significant consequences in regard of the presence of women in reproductive ages. It is followed by Vinh Long (8.6 %) and Dong Thap (9.1%).

Role of Migration within the MDR

As mentioned above, the population of a territorial unit depends not only on natural population development, but also on migration, especially in emerging countries where the level of socio-economic welfare is not evenly distributed among regions. Vietnam is no exception to this.

The Mekong River Delta Region has a long tradition of out-migration because its economic structure is mainly characterized through agricultural activities. The by far most important target region for migrants is the Ho Chi Minh City Metropolitan Region, which has the highest net-migration rate of the whole country. Out-migration volumes from the Mekong Delta Region have generally increased in the past years. This is clearly shown by means of the maps A6 and A7 as part of the annex. In general, a considerably high volatility can be observed from year to year.

From April 2012 till April 2013 alone, that Ho Chi Minh City Metropolitan Region received around 250.000 migrants, which makes almost half of the whole in-migration volume of Vietnam (MPI / GSO 2013). In contrast, the Mekong Delta Region has the highest out-migration volume of Vietnam with -4.3 % respectively about 120,000 people who left that region from April 2012 till April 2013, alone (MPI / GSO 2013). In the same period of time, the Southeast with Ho Chi Minh City Metropolitan Region was the target destination for 93.4% of the out-migrants from the Mekong River Delta.

In the course of the research presented within this chapter, data have been aggregated for several years due the above-mentioned high volatility, to avoid single extreme values and to get a more comprehensive picture, in general.

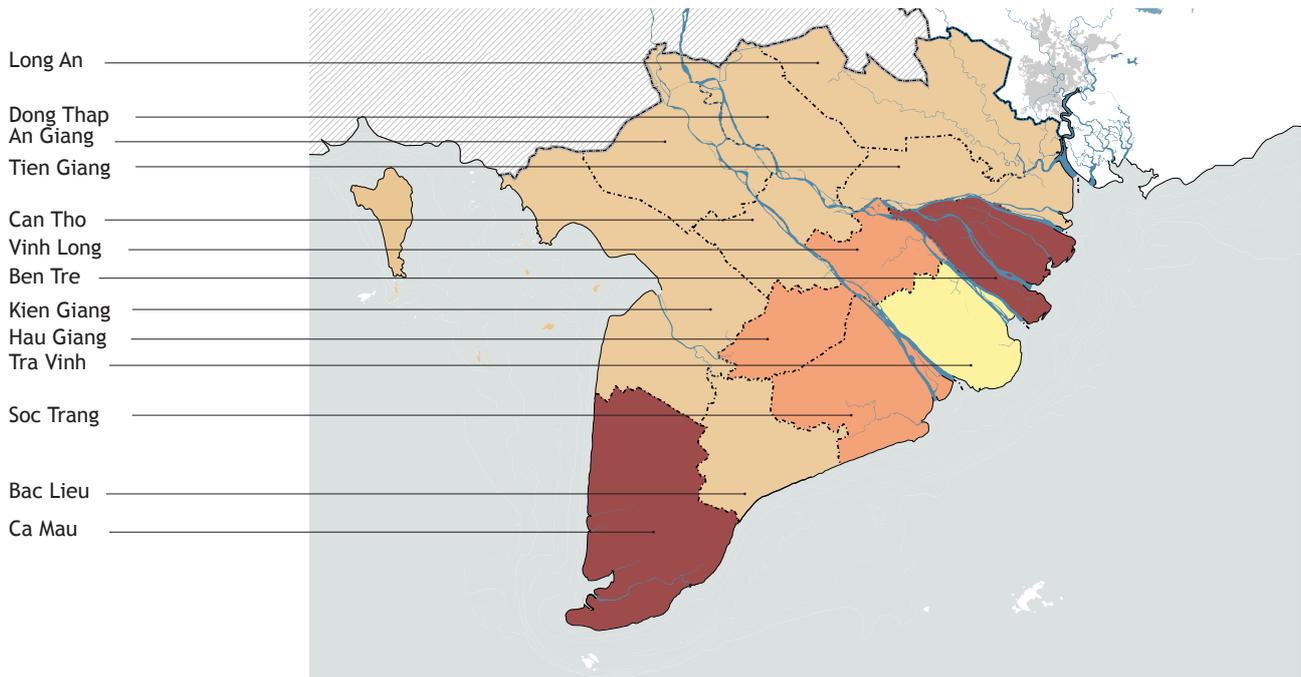
More detailed information on out-migration patterns from 2005-2013 is given within Fig. 3 and Map 6 and 7. The maps illustrate out-migration patterns and the net migration. Within the annex, another map showing in-migration has been added for further information.

The map illustrating out-migration shows that three provinces have considerably high figures in terms of out-migration. Not surprisingly, Ca Mau Province has the highest figure (11.0%) and Ben Tre Province (11.0%) have the highest figures. They are followed by Vinh Long Province (9,4‰), Hau Giang Province (9,4‰) and Soc Trang Province (9.1%). In contrast, Tra Vinh (7.9%) is the province with the lowest out-migration rate.

The map illustrating net-migration flows generally shows that every province in the Mekong Delta region has lost inhabitants due to migration between 2005-2013.

The remotely lying Ca Mau Province has the highest population losses due to migration (-9,6‰), followed by Ben Tre Province (-6.9%), Soc Trang Province (-6.3%) and An Giang Province (-6.1%). In contrast the population loss in the city of Can Tho is rather limited (-1.6%) because it is also benefiting from in-migration in a significant way (also refer to Map A5).

From April 2012 till April 2013, Bac Lieu was the province with the highest negative net-migration rate (-14 net-migrants per 1000 persons), followed by Ca Mau (-9 net-migrants per 1000 residents) and An Giang (-8 net-migrants per 1000 persons). On top of the ranking of the whole of Vietnam, the province with the highest positive net-migration rate is Binh Duong (MPI / GSO 2013).



Map 6: Out-Migration Rates of the Mekong River Delta Region, average value from 2005-2013

- 7.0 till < 8.0 (Min: 7.9)
- 8.0 till < 9.0
- 9.0 till < 10.0
- 10.0 till < 11.0
- 11.0 till < 12.0 (Max: 11.0)

Ø Mekong Delta: 6.7
 Ø Vietnam: 7.7



Source: GSO Vietnam
 © Hamburg University 2015
 Cartography: C. Carstens
 Design: M. Waibel

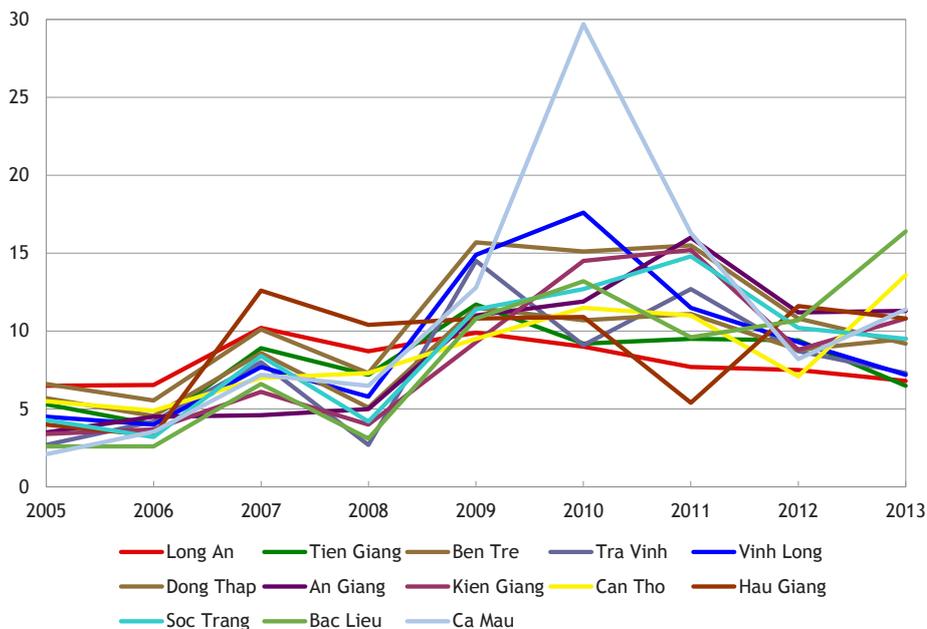
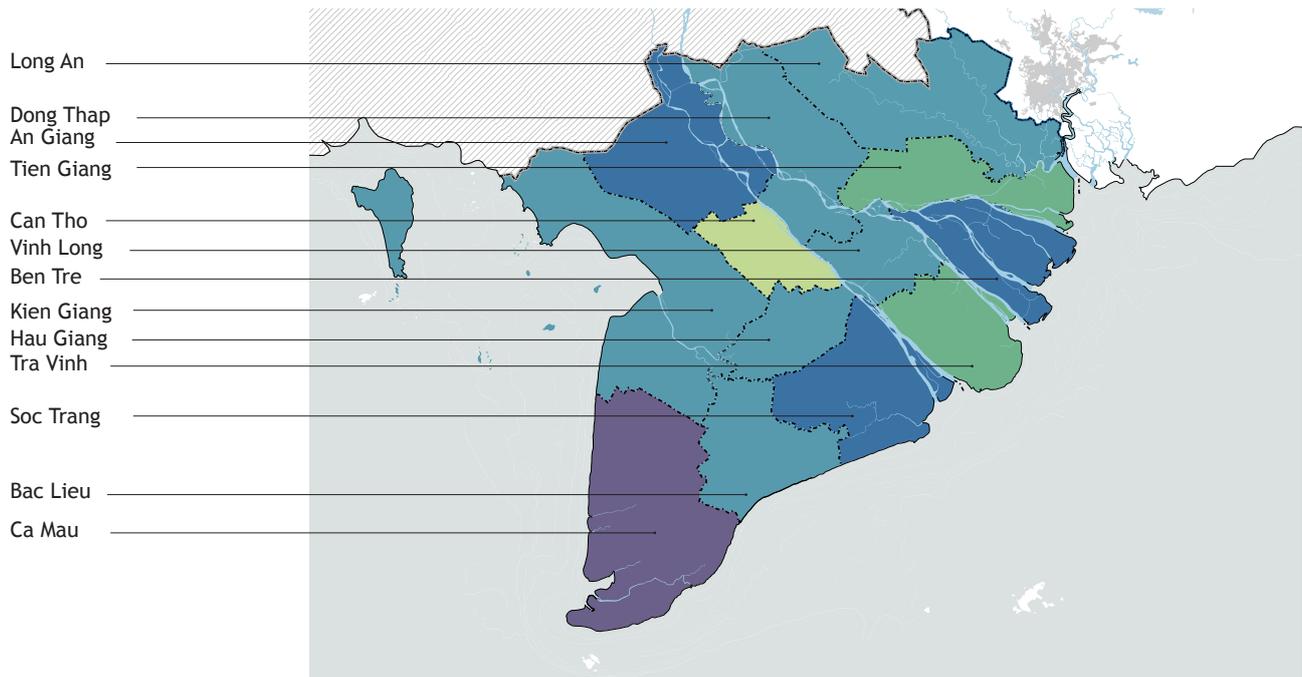


Figure 3: Out-migration rates of the population from the region Mekong River Delta from 2005-2013, in ‰

Source: GSO Vietnam

Remarks: Note: Values for 2006 are interpolated; Estimates for 2013



Map 7: Net-Migration Rates of the Mekong River Delta Region, average value from 2005-2013

0 10 50 100k

- 0.0 till < -2.0 (Min: -1.6) Ø Mekong Delta: -5.5
- 2.0 till < -4.0
- 4.0 till < -6.0
- 6.0 till < -8.0
- 8.0 till < -10.0 (Max: -9.6)
- < -10.0

Source
 GSO Vietnam
 © Hamburg University 2015
 Cartography: C. Carstens
 Design: M. Waibel

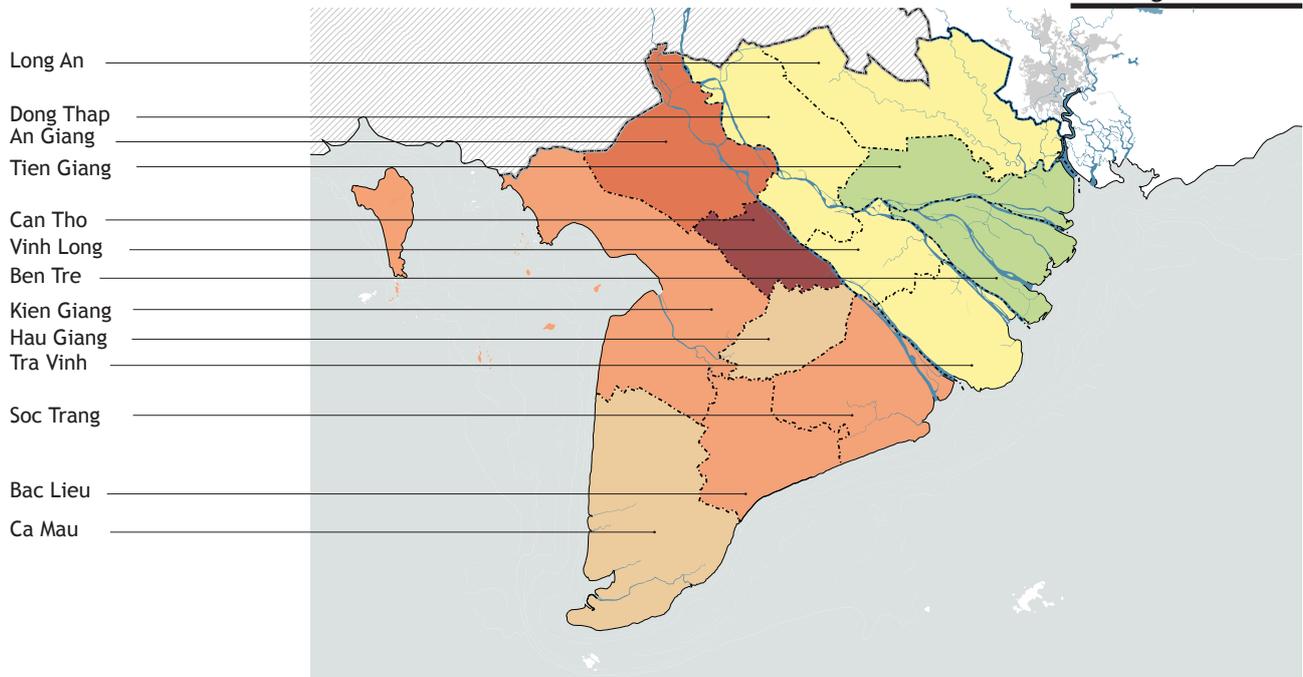
Urbanization within the MDR

Urbanization is a widely recognized indicator for socio-economic modernization. Not surprisingly the urbanization rate of the Mekong Delta Region (1995: 15.7%; 2003: 19.8%; 2013: 24.5%) has always been lower than the national average of Vietnam (1995: 20.0%; 2003: 25.9%; 2013: 32.2%; Source GSO Vietnam). From 2004-2013 the yearly growth of urban population was 2,3% within the Mekong Delta Region and 3,6% in Vietnam (own calculation from GSO Vietnam). In reality, the levels of urbanization might be even less because Vietnam is applying an administrative classification of the urban system. Everyone living within an administrative unit that is labeled as a “city under province level”, “an urban district”, a “town” or a “town under a district” is counted as an urban citizen. It can be safely estimated that some of the Mekong Delta population may still lead a rural lifestyle. However, it has to be mentioned that in more recent years, the speed of urbanization within the Mekong Delta increased and the overall trend got reversed in comparison to the long term development: From 2007-2013 the yearly growth of urban population was 3.7% within the Mekong Delta Region and 2.7% in Vietnam (own calculation from GSO Vietnam). If the reason for this has been just administrative-re-classification or qualitative urbanization needs to be further discussed with local experts.

In the case of the Ho Chi Minh City Region though, the situation is much more evident that urbanization levels are higher than official figures indicate: One important reason for this is that urbanization has already transgressed from urban districts into areas still classified as rural. Not surprisingly the most important city of the Mekong Delta, Can Tho, has the

highest urbanization level, following by the neighboring An Giang Province. The province with the lowest urbanization rate is Ben Tre province, which is the province with the highest level of out-migration at the same time. Ca Mau as the other province with a very high level of out-migration has a moderate urbanization level though. This indicates about the rather strong concentration of the population in urban settlements, there. The higher levels of urbanization are reflected in relative high figures of the monthly average income per capita in Ca Mau. Those are about on the same level as the average of the whole Mekong Delta Region (GSO 2014: 348). According to an expert at SISP this is mainly due to flourishing aqua-culture business, related agro-industries and due to natural gas exploration along the coastline of Ca Mau.

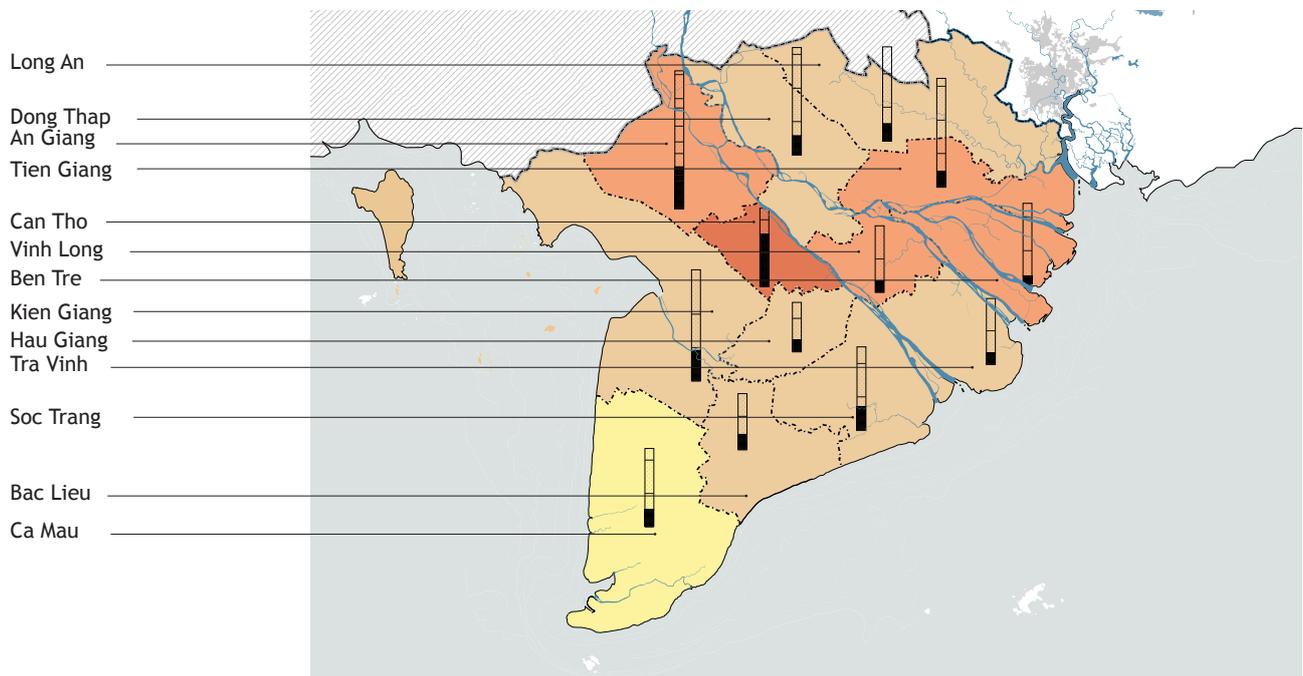
The poverty rates within the Mekong Delta Region are slightly lower than the national average of Vietnam. Basic poverty does not seem to be a major problem. Soc Trang Province and Tra Vinh Province are the administrative entities with the highest poverty rates. It is unclear though how remittances from labor migrants working in the HCMC Region are statistically counted.



Map 8a: Urbanization Rates of the Mekong River Delta Region, 2013

0 10 50 100k
 Source: GSO Vietnam

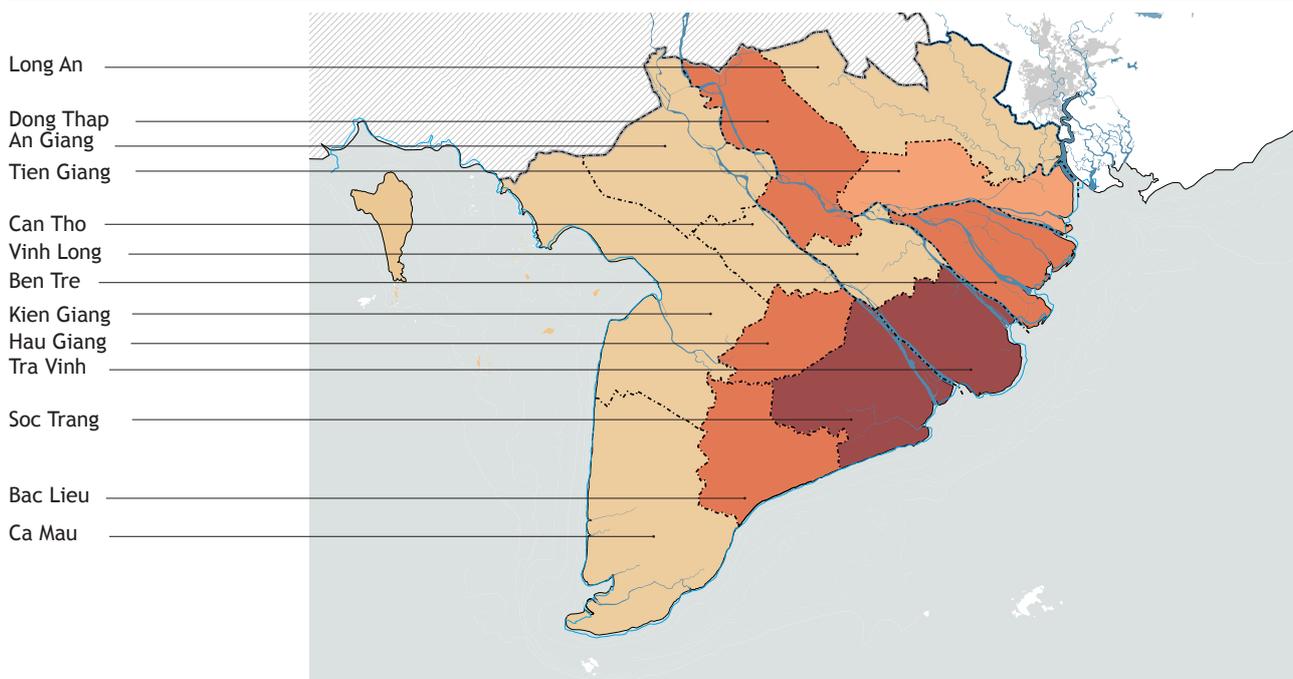
- < 15 (Min: 10)
 - 15 till < 20
 - 20 till < 25
 - 25 till < 30
 - 30 till < 40
 - > 40 (Max: 66,5)
- Ø Mekong Delta: 24.5
 Ø Vietnam: 32.2



Map 8b: Shares of urban and of rural population and population densities of the Mekong River Delta Region, 2013

0 10 50 100k
 Source: GSO Vietnam

- 0 till < 250 (Min: 230)
 - 250 till < 500
 - 500 till < 750
 - 750 till < 1, (Max: 868)
- Ø Density Mekong Delta: 432
 Ø Density Vietnam (total): 271
- Inhabitants
- 1,000,000
 500,000
 0
- Rural population
 ■ Urban population



Map 8c: Poverty rates of the Mekong River Delta Region, 2013

- 5.0 till < 7.5 (Min: 5.3)
- 7.5 till < 10.0
- 10.0 till < 15.0
- > 15.0 (Max: 17.7)

Ø Mekong Delta: 9.2
 Ø Vietnam: 9.8

Source: GSO Vietnam

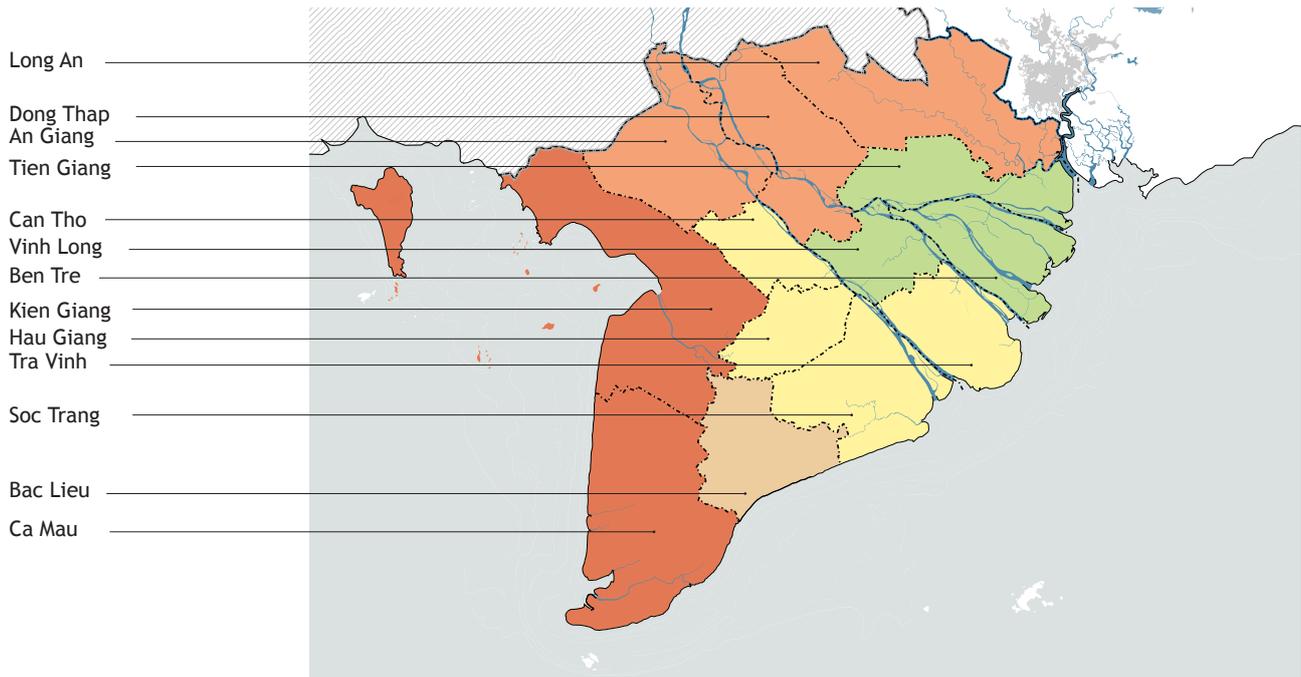
The poverty rates within the Mekong Delta Region are slightly lower than the national average of Vietnam. Basic poverty does not seem to be major problem. Soc Trang Province and Tra Vinh Province are the administrative entities with the highest poverty rates. It is unclear though how remittances from labour migrants working in the HCMC Region are statistically counted.

In regard of the urbanization in the future it is expected that urbanization rates within the Mekong Delta will continue be lower than national average. To calculate the future level of urbanization a linear extrapolation from the urbanization growth rate of the past 10 years, more precisely from 2003 till 2013 has been made.

The extrapolation shows, that given the continuation of the development trend in the past, the level of urbanization in the Mekong Delta Region will be 38,2% in 2030. Following the same methodology the level of

urbanization in Vietnam will be 53,1%. The figures for every year till 2030 are shown at Fig. 4, see below. Information in regard of variations +10/-10% in the year 2030, as provided, as well.

The application of the extrapolation methodology till 2050 seems questionable though, because it can be safely expected that the development dynamics will flatten in the course of time. If you apply this methodology, the level of urbanization would be 64,4% in the Mekong River Delta Region and 95,7% in Vietnam in the year 2050. Therefore, the application of logistic growth curve may make more sense in that context. In case of interest in this more complex approach from the side of the contractor this methodology would be pursued in the next report.



Annex Map A1: Population Development of the Mekong River Delta Region from 1994-2002

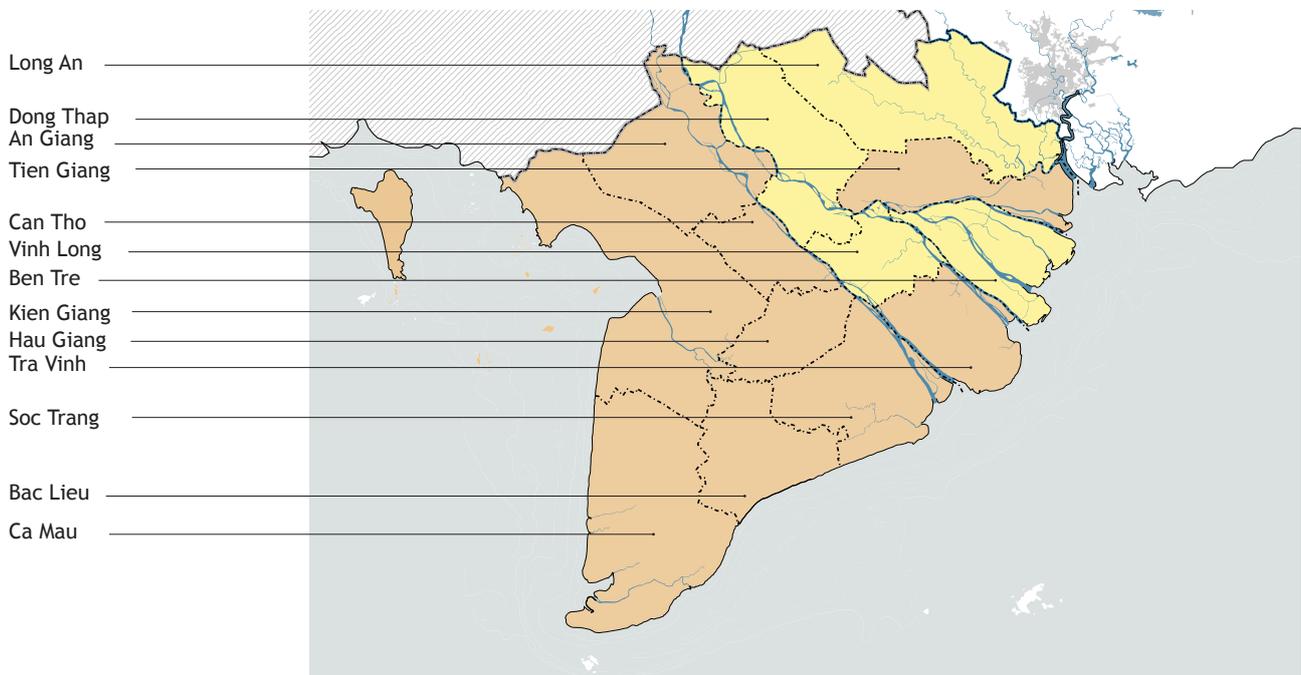
0 10 50 100k



- -5.0 till < 0 (Min: -4.2)
- 0.0 till < 2.5
- 2.5 till < 5.0
- 5.0 till < 10.0
- 10.0 till < 20.0 (Max: 14.7)

Ø Mekong Delta: 3.6
Ø Vietnam: 8.5

Source: GSO Vietnam
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Cartography: C. Carstens
Design: M. Waibel



Annex Map A2: Population Development of the Mekong River Delta Region from 2003-2006

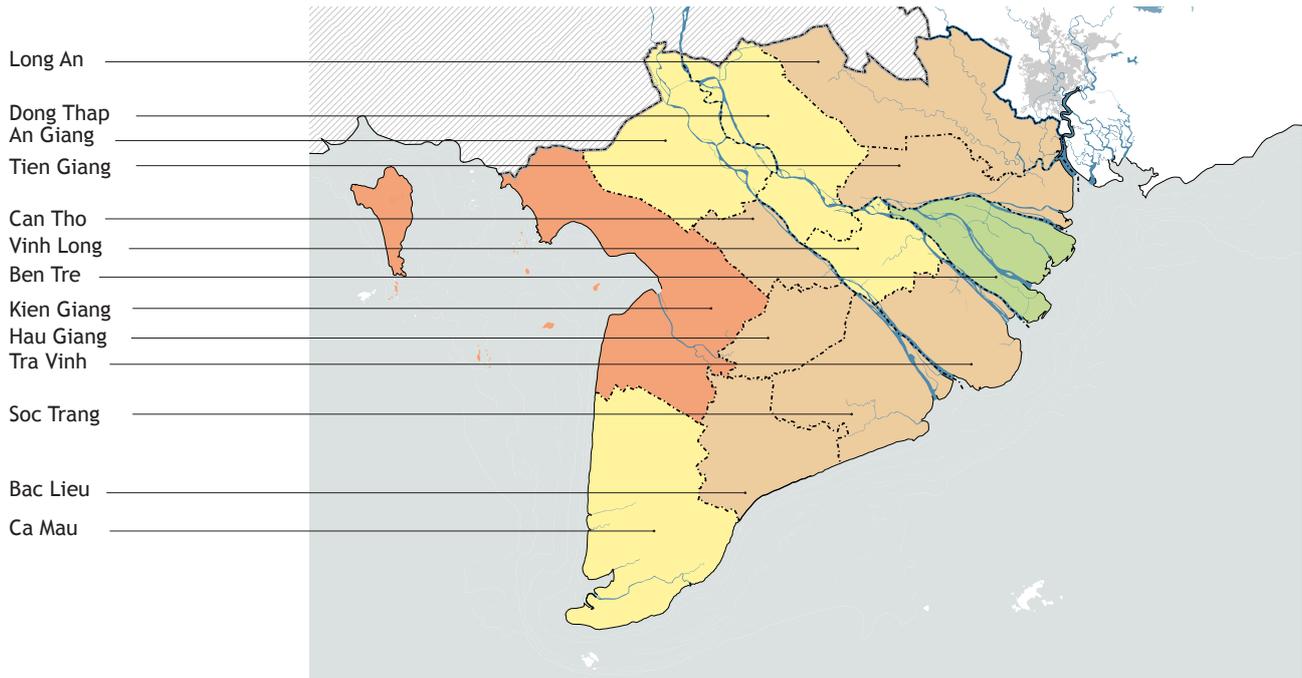
0 10 50 100k



- 2.5 till < 5.0 (Min: 3.8)
- 5.0 till < 10.0 (Max: 7.5)

Ø Mekong Delta: 3.0
Ø Vietnam: 3.5

Source: GSO Vietnam
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Design: M. Waibel



Annex Map A3: Population Development of the Mekong River Delta Region from 2007-2013

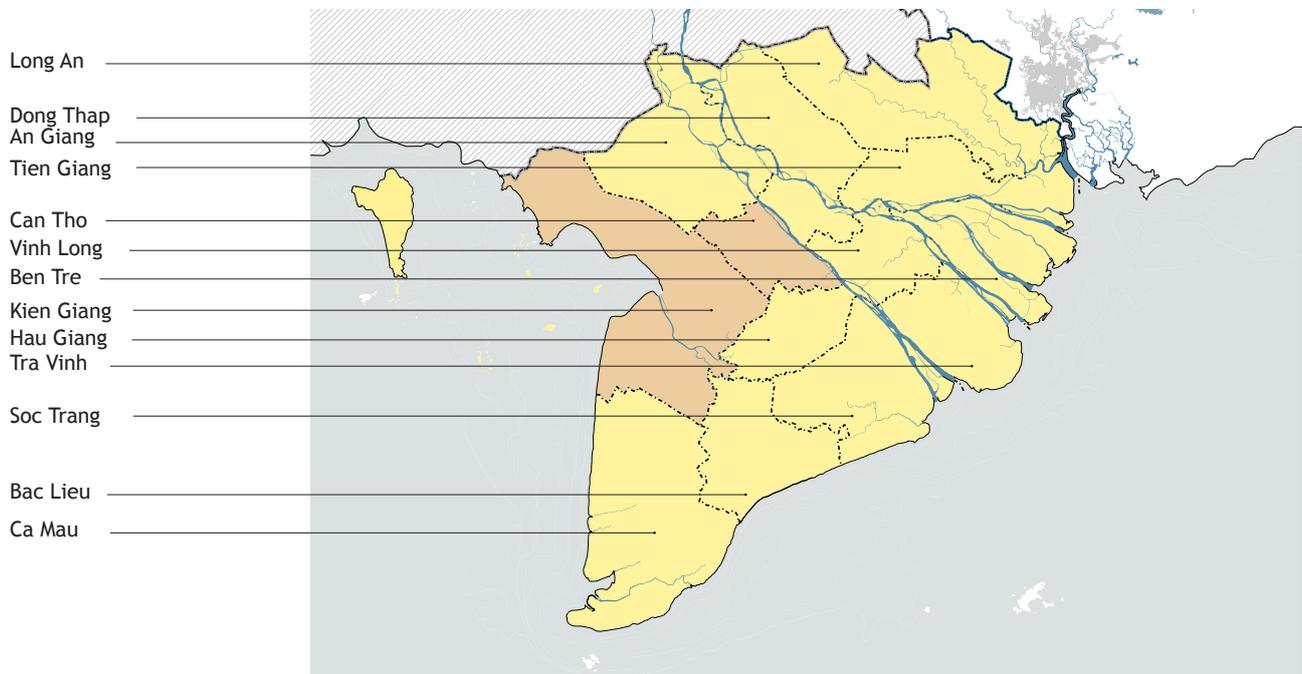
0 10 50 100k



- -5.0 till < 0.0
- 0.0 till < 2.5 (Min: 0.4)
- 2.5 till < 5.0 (Max: 3.0)

Ø Mekong Delta: 2.6
 Ø Vietnam: 6.5

Source
 GSO Vietnam
 © Hamburg University 2015
 Cartography: C. Carstens
 Design: M. Waibel



Annex Map A4: In-Migration Rates of the Mekong River Delta Region, average value from 2005-2013

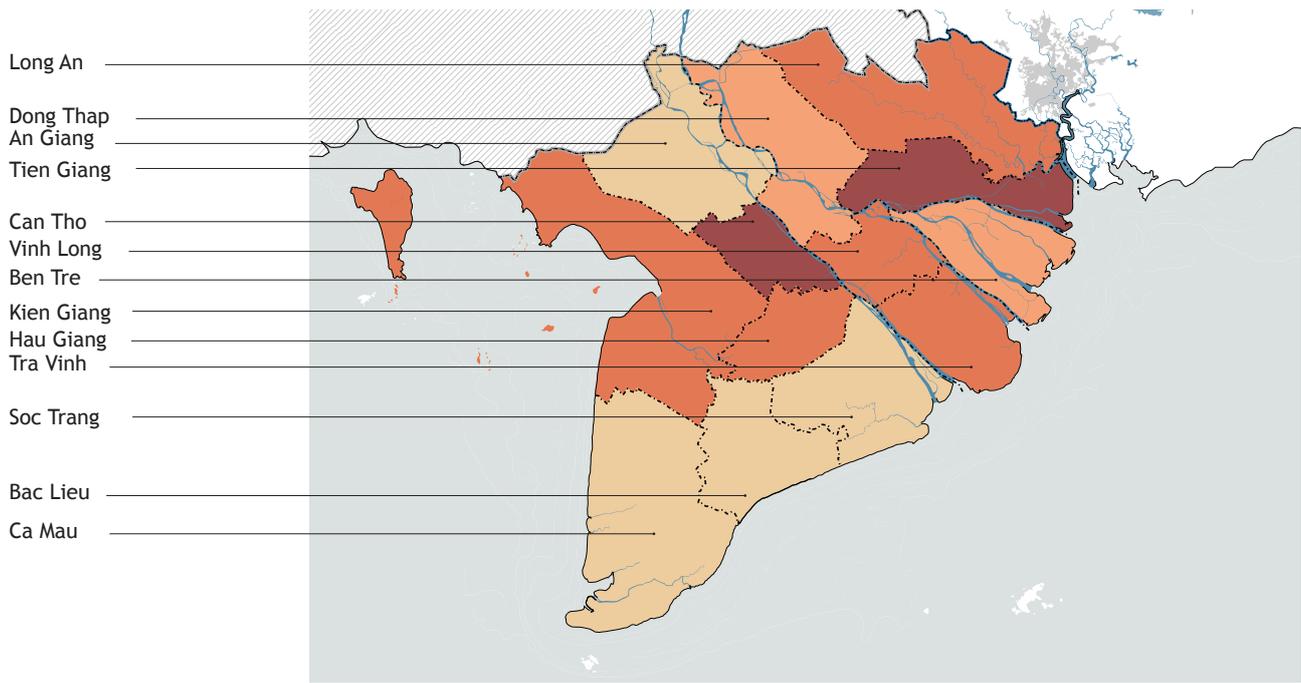
0 10 50 100k



- 0.0 till < 2.5 (Min: 0.4)
- 2.5 till < 5.0 (Max: 3.0)

Ø Mekong Delta: 0.4
 Ø Vietnam: 3.0

Source
 GSO Vietnam
 © Hamburg University 2015
 Cartography: C. Carstens
 Design: M. Waibel

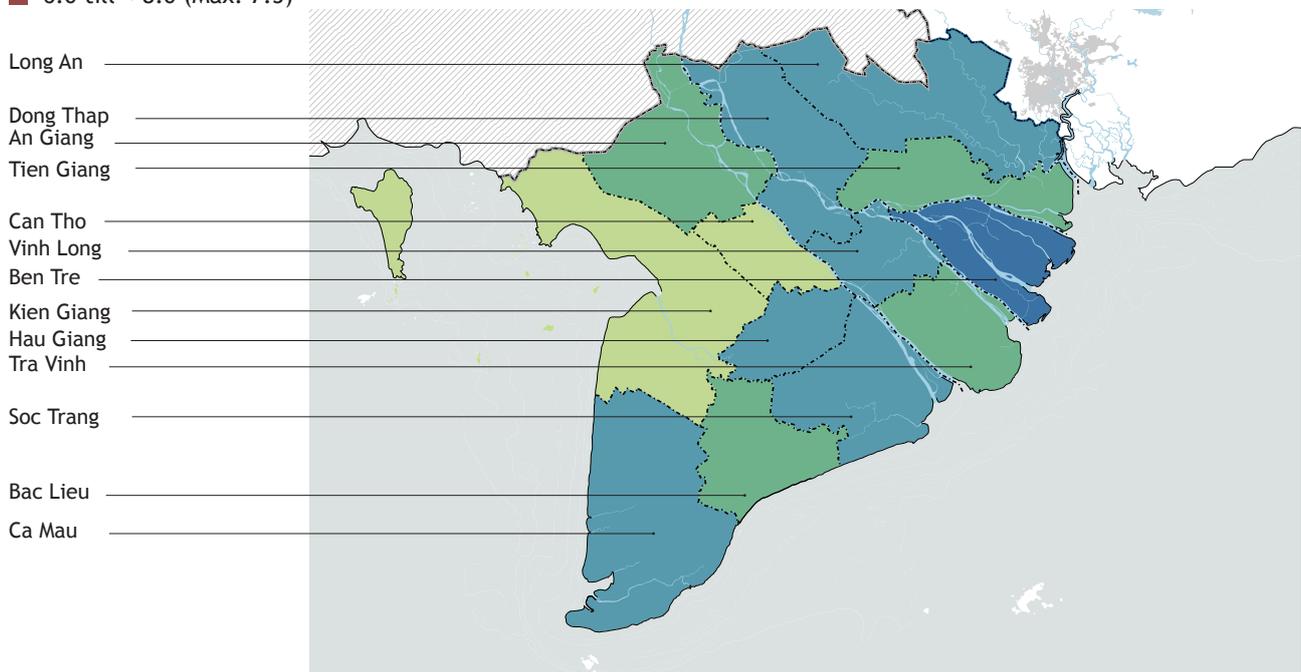


Annex Map A5: Net-Migration Rates of the Mekong River Delta Region, average value from 2005-2009



- 1.0 till < 2.0 (Min: 1.7)
 - 2.0 till < 3.0
 - 3.0 till < 4.0
 - 4.0 till < 6.0
 - 6.0 till < 8.0 (Max: 7.5)
- Ø Mekong Delta: 1.7
Ø Vietnam: 7.7

Source: GSO Vietnam
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Cartography: C. Carstens
Design: M. Waibel



Annex Map A6: Net-Migration Rates of the Mekong River Delta Region, average value from 2009-2013



- 0.0 till < -2.0 (Min: -0.8)
 - 2.0 till < -4.0
 - 4.0 till < -6.0
 - 6.0 till < -8.0
 - 8.0 till < -10.0 (Max: -6.9)
- Ø Mekong Delta: 4.3

Source: GSO Vietnam
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Cartography: C. Carstens
Design: M. Waibel

Interpretative Mapping of Existing Conditions

Soil Types

The soil composition in the MDR is complex and dynamic: it changes with both natural and anthropogenic processes. The major soil types are sandy soils and acid sulphate soils (ASS) 1,590,000 ha; saline & potential ASS 1,080,000 ha; alluvial soils 1,100,000 ha; the remainder are soils are mountainous and peat soils. The interaction of the different soil types in the delta with seasonal variations in water flow, rainfall and tides combine to create diverse agro-ecological zones throughout the delta. Such differences allow for important niches for resource-based livelihoods. The significant Acid sulphate soils (ASS): Large areas of Long Xuyen Quadrangle and the Plain of Reeds and other scattered lands have soils with high iron sulphide content, covering 1.6 million hectares (40%) of the Mekong Delta. Floods can transport toxic water from ASS areas to other non-ASS areas (Le et al. 2007: 25).

- | | |
|----------------------|--------------------------------|
| Productive landscape | Road infrastructure |
| ■ Orchards | == Existing Highway |
| ■ Agriculture | === Planned Highway |
| ■ Aquaculture | === Highway under construction |
| Forestry | — National road |
| ■ Productive forest | Ports |
| ■ Protection forest | ⚓ First class sea port |
| ■ Specialized forest | ⚓ Second class sea port |
| Urbanization | |
| ■ Urban areas | |
| ■ Industrial areas | |

SANDY SOILS

- Cz Raised ridges sandy soils

SALINE SOILS

- Mm Saline Mangrove soils
- Mn Strongly Saline Soils
- M Moderately Saline Soils
- Mi Slightly Saline Soils

ACID SULPHATE SOILS

- Sp1mm PAS Mangrove Soils - Sulfidic material: 0-50cm
- Sp2Mm PAS Mangrove Soils - Sulfidic material: > 50 cm
- Sp1m Saline - PAS Soils - Sulfidic material: 0 - 50 cm
- Sp2m Saline - PAS Soils - Sulfidic material: > 50 cm
- Sp1 PAS Soils - Sulfidic material : 0 - 50 cm

Actual Acid Sulphate Soils (ASS)

- Sj1m Saline - ASS - Sulfuric horizon: 0 - 50 cm
- Sj2m - Saline - ASS - Sulfuric horizon: > 50 cm
- Sj1 Actual ASS - Sulfuric horizon: 0 - 50 cm
- sj2 Actual ASS - Sulfuric horizon: >50cm

ALLUVIAL SOILS

- Pb Deposited Alluvial Soils
- P Undeposited Alluvial Soils
- Pg Gleyic Alluvial Soils

PEATY AND MUCK SOILS

- Peat

GREY SOILS

- X Grey Soils on old Alluvium
- Xg Humic Grey Soils on old Alluvium
- Xa Gleyic-degraded Grey Soils on Acid Igneous Rocks & Sandstones

ERODED SOILS

- E Eroded soils

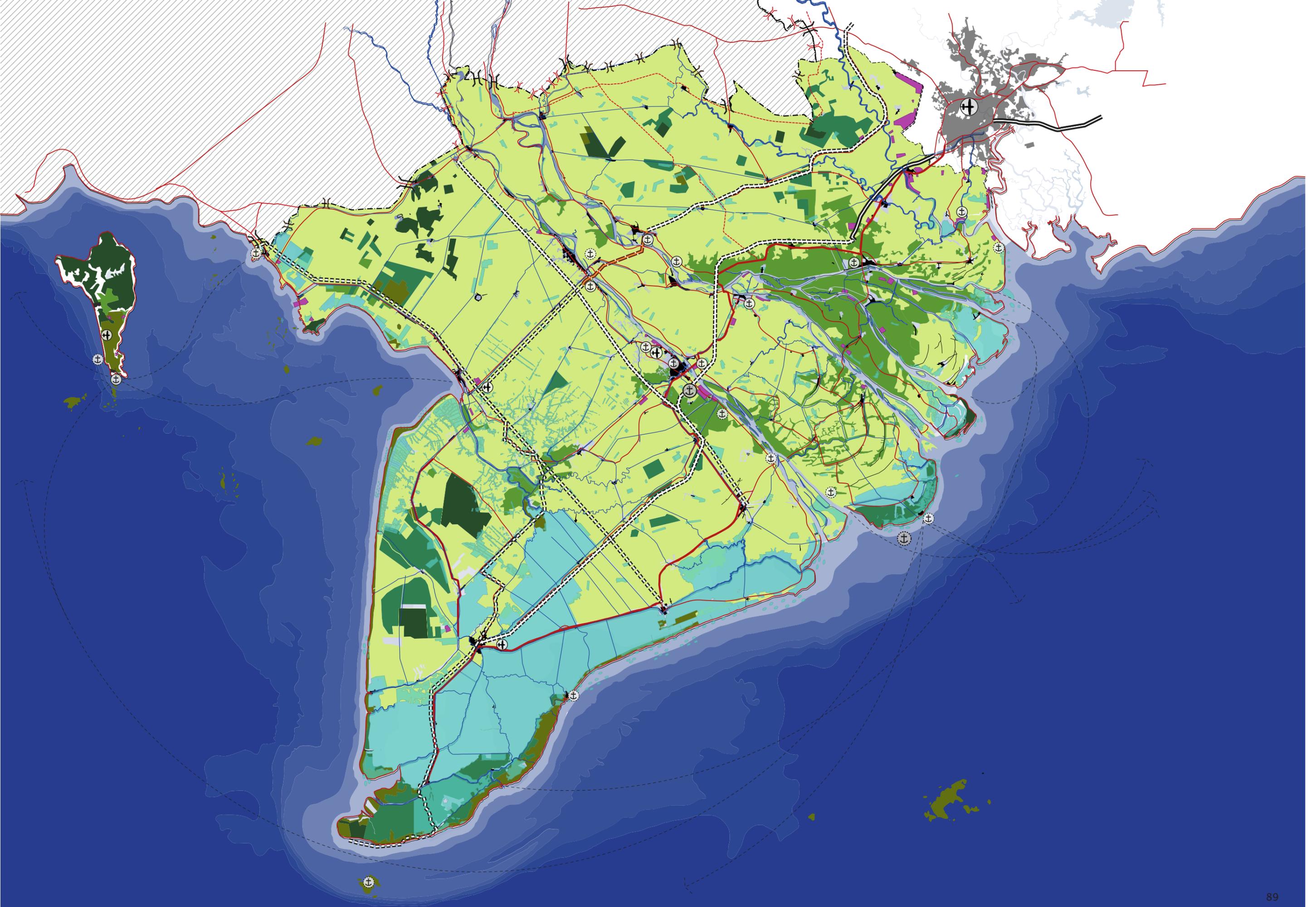
YELLOW - RED SOILS

- Red-yellow Soils on Acid Igneous Rocks



Source

The Southern Institute of Water and Resource Planning, 2012. Master plan in the Mekong Delta for impact of climate change - sea level rise.



Projection of population growth (2030, 2050, 2100)

Dr. Michael Waibel – Department of Geography – Hamburg University, Germany

To know about the future population number of a spatial-administrative unit is essential for planning authorities in order to provide adequate social and technical infrastructure, for example.

Regarding a population prognosis of the Mekong Delta provinces, a simple mathematical methodology was chosen as a first step. It consists of a linear extrapolation from the average population growth rate of the past years, more precisely from 2007 until 2013. 2007 as starting date was chosen because between 2006 and 2007 some irregularities in the statistical methodology are assumed (see chapter 1). The extrapolation of population growth in the MDR shows that it will have a population of 18,792,860 people in the year 2030. This is an absolute increase of 1,313,958 people and a relative increase of 7.5% in comparison to the year 2013. This population growth is much less than the one anticipated for the whole of Vietnam by applying the same methodology. In the case of the whole of Vietnam it would be 107,800,82 people in the year 2030. The absolute increase would be 18,091,924 people and the relative increase 20.2% in comparison to the year 2013.

Obviously, future population growth would not be equally distributed within the MDR. There will be provinces with high population gains such as Kien Giang Province (+15,4%), Bac Lieu (+14,8%) or Can Tho (+12,9%) and provinces with only moderate population gains such as Hau Giang (+7,4%), Soc Trang (+7,4%) or Tien Giang (+7,4%). Ben Tre is even expected to slightly decrease its population (-0,6%).

Following the same methodology as explained above, another prognosis in regard of the

Mekong Delta has been made until 2050. According to this prognosis, the MDR will have a population of 20,465,702 people in the year 2050. This is an absolute increase of almost three million people (2986,802) and a relative increase of 17.1% in comparison to the year 2013. Same as in regard of the prognosis till 2030, the population growth is much less than the one anticipated for the whole of Vietnam. Regarding the whole of Vietnam it would be 133,810,013 people in the year 2050. In that case, the absolute increase would be more than 44 million people (44,101,113) people and the relative increase 49.2% in comparison to the year 2013. Of course, the latter scenario does not seem realistic, at all. In the course of further economic development the fertility rates will further decrease, the urbanization rates will increase and for this reason the overall population increase is expected to slow down.

Obviously, future population growth will not be equally distributed within the MDR and obviously the differences in population numbers will further increase during the course of time. There could be five provinces with population gains higher than 20% in the year 2050 compared to the year 2013. Those provinces are Kien Giang (+36,5%), followed by Bac Lieu (+35,2%), Can Tho (+30,2%), Long An (25,3%) and Tra Vinh (20,6%). Provinces with only moderate population gains will be Hau Giang (+16,9%), Soc Trang (+16,7%) or Tien Giang (+16,7%). Ben Tre province is even expected to decrease its population (-1,4%).

Further, it has been mentioned that it is not realistic that population trends from the past will continue to be the same in regard of such a long timeline ahead. For example, threats related to climate change such as sea level rise, extreme weather events or saltwater

intrusion will affect the MDR provinces to a different extent. This will have consequences on migration patterns, for example. Also, some provinces will do better in regard of their economic performance against the background of the general shift towards a more knowledge-based society and tertiarisation, in general. Can Tho as major city of the Mekong Delta will be probably benefit mostly from the latter development. If the island of Phu Quoc will further develop into a major international tourism hub, a lot of in-migration will happen, there, just to give another example.

Prognosis

The basic prognosis has been complemented by four variations, 1) a small variation of the average growth rate of the years 2007-2013 of +10% and of -10% constant change and 2) a medium variation of the average growth rate of the years 2007-2013 with +25% and -25% constant change.

According to the prognosis with a small variation of +10% the MDR will have a population of 18,929,247 people in the year 2030 (relative increase of 8,3% in comparison to 2013) and of 20,790,353 people in the year 2050 (19,0%).

According to the prognosis with a medium variation of +25% the MDR will have a population of 19,135,578 people in the year 2030 (relative increase of 9,5% in comparison to 2013) and of 21,286,744 people in the year 2050 (21,8%).

According to the prognosis with a small variation of -10% the MDR will have a population of 18,657,394 people in the year 2030 (relative increase of 6,7% in comparison to 2013) and of 20,145,986 people in the year 2050 (15,2%). According to the author

this prognosis variation seems to be the most realistic one, because birth rates are expected to further decrease in the course of further economic modernization and overall development.

According to the prognosis with a medium variation of -25% the MDR will have a population of 18,455,9211 people in the year 2030 (relative increase of 5,6% in comparison to 2013) and of 19,675,5043 people in the year 2050 (12,6%).

In regards to future urbanization, it is expected that urbanization rates within the MDR will continue to be lower than the national average. To calculate the future level of urbanization a linear extrapolation from the urbanization growth rate of the past 10 years, more precisely from 2003 until 2013 has been made. The extrapolation shows, that given the continuation of the development trend in the past, the level of urbanization in the MDR will be 38,2% in 2030. Following the same methodology the level of urbanization in Vietnam will be 53,1%. The figures for every year until 2030 are shown at Fig. 4, see below. Information in regard of variations +10/-10% in the year 2030, as provided, as well. The application of the extrapolation methodology till 2050 seems questionable though, because it can be safely expected that the development dynamics will flatten in the course of time. If you apply this methodology, the level of urbanization would be 64,4% in the MDR and 95,7% in Vietnam in the year 2050. Therefore, the application of logistic growth curve may make more sense in that context.

Year	2013	2014	2015	2016	2017	2018	2019
Mekong River Delta Region	24,5	25,2	25,8	26,5	27,2	27,9	28,7
Vietnam	32,2	33,1	34,1	35,2	36,2	37,3	38,4
Year	2020	2021	2022	2023	2024	2025	2026
Mekong River Delta Region	29,4	30,2	31,0	31,8	32,7	33,5	34,4
Vietnam	39,6	40,7	42,0	43,2	44,5	45,8	47,2
Year	2027	2028	2029	2030	2030 -10%	2030 +10%	
Mekong River Delta Region	35,3	36,3	37,2	36,7	35,3	38,2	
Vietnam	48,6	50,1	51,6	50,8	48,6	53,1	

Fig. 4: Projection of development of level of urbanization till 2030, in %

Source: Own calculation

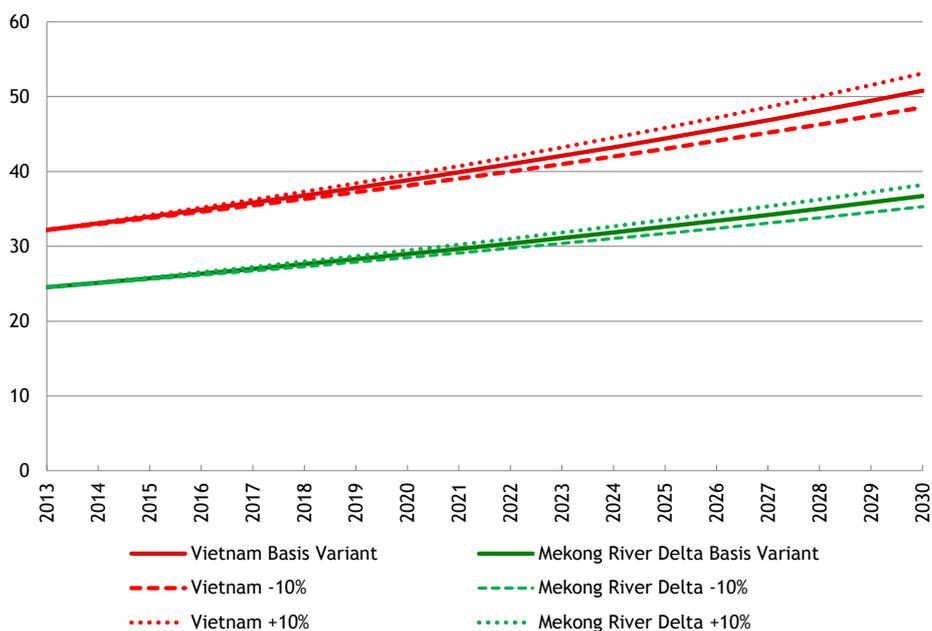
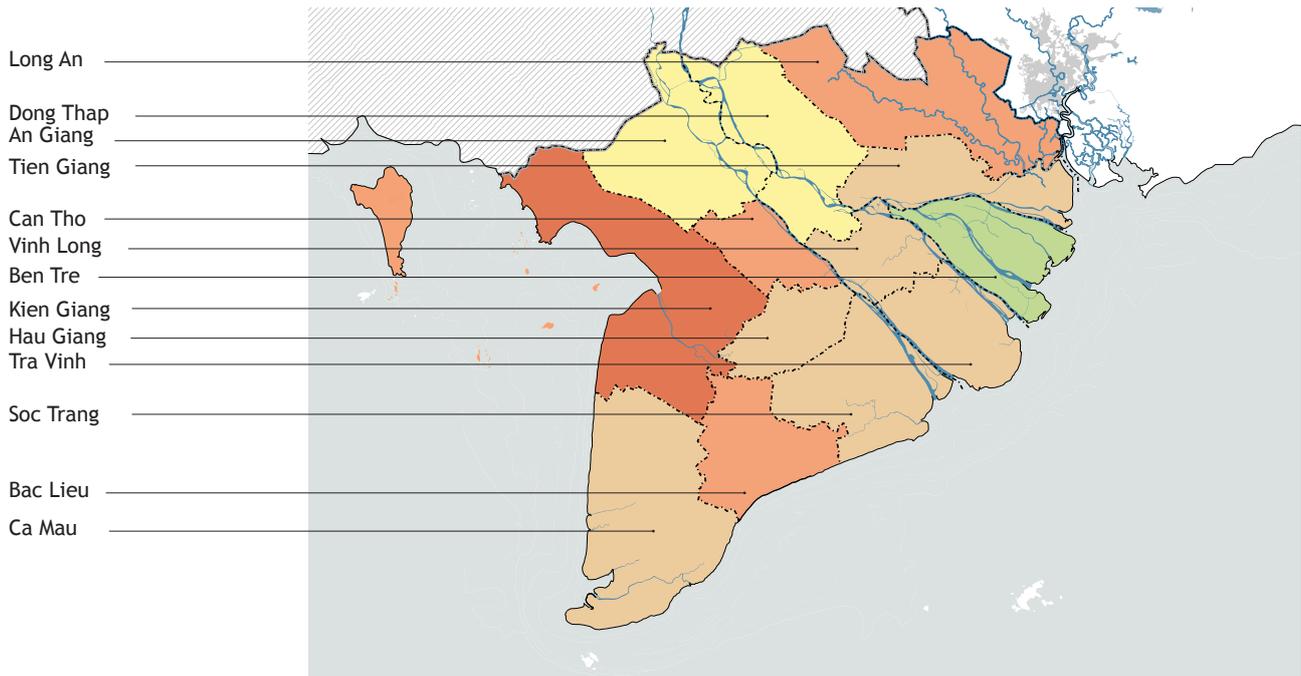


Fig. 5: Projection of development of level of urbanization till 2030, including variations +/- 10%, in %

Source: Own calculation



Map 9: Mekong Delta Population Prognosis 2013-2030

- -5.0 till < 0 (Min: 0.6)
- 0 till < 5.0
- 5.0 till < 10
- 10 till < 15
- 15 till < 20 (Max: 15,4)

∅ Mekong Delta: 7.5
∅ Vietnam: 20.2

Source: GSO Vietnam
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Cartography: C. Carstens
Design: M. Waibel

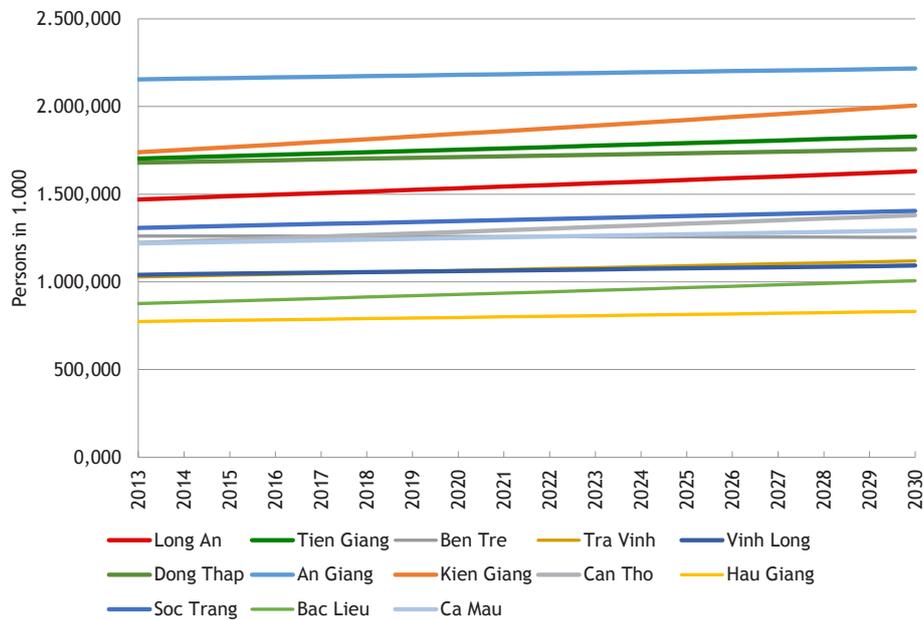
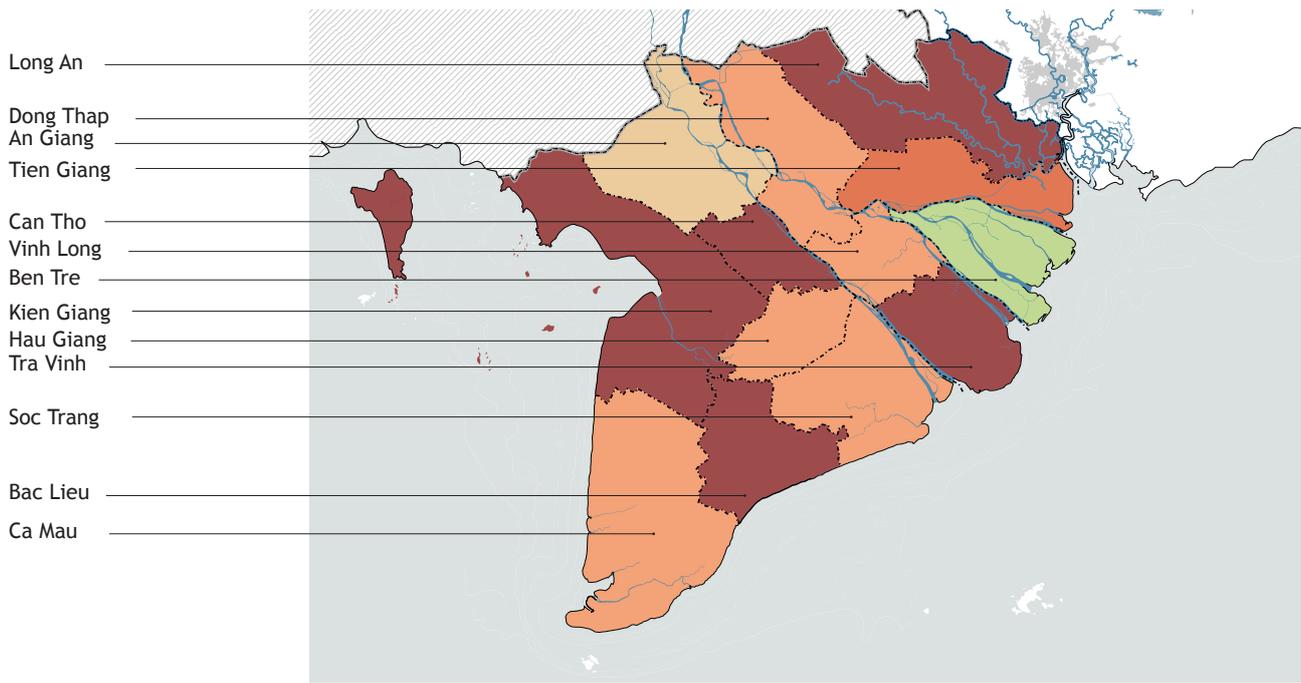


Fig. 6: Mekong Delta Population Prognosis 2013-2030

Source: Own calculation



Map 10: Mekong Delta Population Prognosis 2013-2050

- -5.0 till < 0 (Min: -1.4)
- 0.0 till < 5.0
- 5.0 till < 10.0
- 10.0 till < 15.0
- 15.0 till < 20.0
- > 20.0 (Max: 36.5)

Ø Mekong Delta: 17.1
 Ø Vietnam: 149.1

Source: GSO Vietnam
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 Cartography: C. Carstens
 Design: M. Waibel

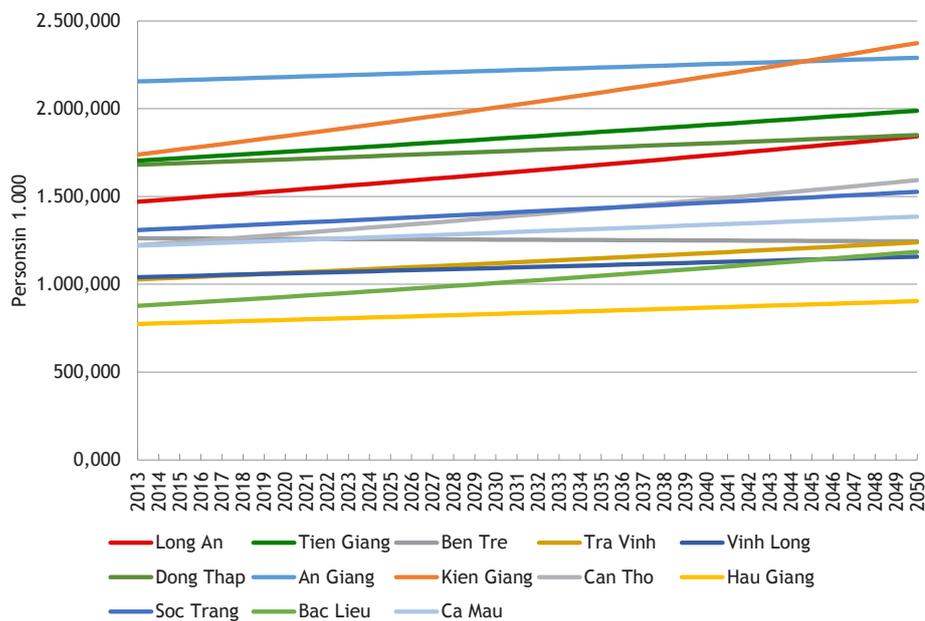


Fig. 7: Mekong Delta Population Prognosis 2013-2050

Source: Own calculation

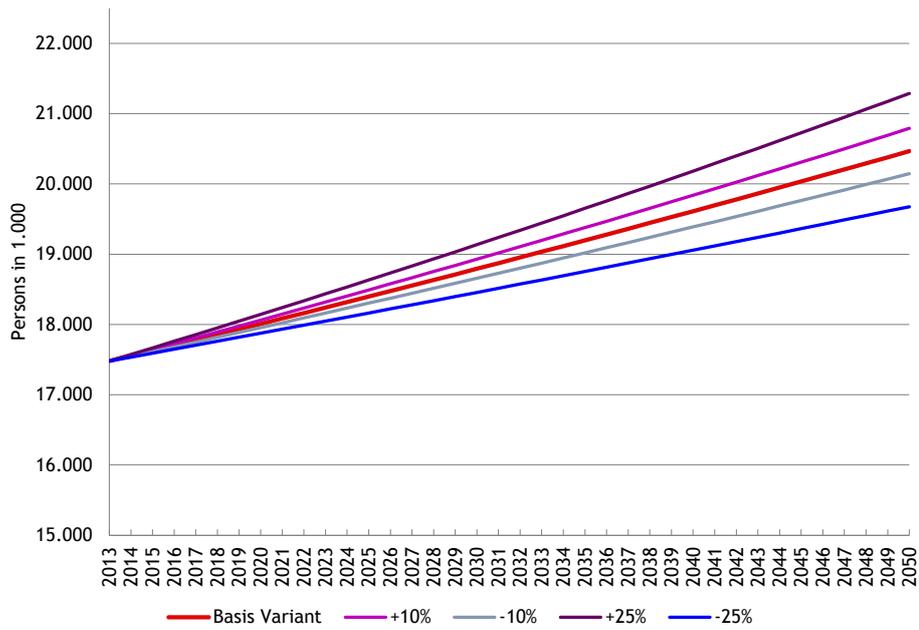


Fig. 8: Mekong Delta Population Prognosis Variations 2013-2050

----- Source
Own calculation

MEKONG DELTA REGIONAL PLAN VISION 2050

1 RECOGNITION THAT WATER + AGRI- & AQUACULTURE = MDR

Water is by definition the DNA of the MDR & sustainable water management is essential for sustainable development of the MDR

This includes the systematic improvement, extension, adaption and modernisation of water infrastructures such as waterways, fresh water distribution, irrigation and drainage, water storage, containment of saline intrusion & water purification facilities.

An agri- & aquacultural region by nature

The interplay of water and soil generates the extra-ordinary fertility of the MDR. This is the main asset of the MDR. Its natural, and consequentially evident and sustainable destiny is that of a region, concentrating on and specialised in agri- and aquaculture and marine economies.

2 NEED TO BALANCE BETWEEN ECONOMY & ECOLOGY

Re-establish a balance between economy and ecology

The sustainable development of the MDR requires the re-establishment of a balance between economic exploitation of natural resources and ecological integrity.

Creation of a new economy which balances monocultures and special products

A substitution of (low value) monocultures that erode the environmental qualities with new (high value) special species that can be embedded in the rich ecology of the MDR is not only necessary to avoid an unavoidable environmental crisis, but also to diversify the economy (that will consequently gain robustness).

3 LOCAL PROCESSING OF AGRI-, AQUACULTURE & FORESTRY PRODUCTS

Local processing of agri-, aquaculture & forestry products

This diversification makes the economy of the MDR more robust. Enhancing local processing of the agro- and aqua-cultural produce of the MDR generates an endogenous process of industrialisation in sectors where it has competitive advantages to other regions in Vietnam (nearby-ness, local knowledge, tradition, etc.). A larger part of the value chain would therefore remain in the MDR

Optimal agro-eco regional development

Smart sustainable development means anchoring development on the specific environmental characteristics of the agro-ecological regions within the MDR.

4 CLIMATE CHANGE AS A THREAT & AN OPPORTUNITY

Address climate change on systemic level

As has become tradition in the MDR, it is good policy to rather work with the forces of nature (inundations, monsoons, droughts, salination, etc.) rather than to try to impose on nature.

Protection and safety with natural means

a policy shift from hard-engineering (dykes, etc.) towards natural means (systemic afforestation, regeneration and extension of mangroves, etc.) simultaneously restores ecologies & generates opportunities to embed new sustainable economies (sustainable shrimp farming within mangroves, medicinal plants in forests, etc.)

5 SUSTAINABLE DEVELOPMENT

Limit land consumption

Urban development and industrial areas must to be reoriented to **stop further unnecessary consumption of the most valuable asset of the region: productive landscapes**. Cities must begin **densification** rather than further extension.

Accept out-migration

The MDR has experienced for quite some time **important out-migration** (amongst others to the economic magnet Ho Chi Minh City). This is **not dramatic**, but rather natural. The MDR economically develops as far as the balance of ecology and economy allows and in this way safeguards its future (and Vietnam's food security)

6 INFRASTRUCTURE DEVELOPMENT TAILORED TO SPECIFITIES OF MDR

Strategic infrastructure provision

Much more then in most contexts worldwide, infrastructure is very expensive. It is wise to shift the transport policy from a general and equal covering of the territory with infrastructure to a strategic choices (for the most effective/ efficient ones to begin with)

Shift investment from roads to waterways

Waterways have been the natural mode of transport in the MDR for centuries. They still today are the most appropriate mode of transportation for agricultural mass produce.

MEKONG DELTA REGIONAL PLAN CONCEPTS to REALIZE VISION 2050

1 ACCENTUATE AGRO-ECOLOGICAL ZONES (RECOGNITION THAT WATER + AGRI- & AQUACULTURE = MDR)

The interplay between water quality, quantity and seasonal variation, soil conditions, climate change effects (saline intrusion, inundation) and the existing and potential future economic exploitation of this environmental conditions and assets define six agro-eco (sub)regions with each an articulated identity.

The MDR Plan explicitly chooses to anchor future economic development on the accentuation of the potentially inherently embedded within the six agro-eco (sub)regions.

2 DEVELOP THE MDR AS BOTH A PERFORMATIVE ECOLOGICAL AND PRODUCTIVE MACHINE (NEED TO BALANCE BETWEEN ECONOMY & ECOLOGY)

Develop the existing aqua- and agriculture in the MDR as well as invest in new hi-tech, high-yield systems that work with state-of-the-art technology to upscale economies. Ecological restoration and afforestation (particularly along the coast) is to be developed hand-in-hand with new techniques of aquaculture and processing areas can created in areas that are not detrimental to the environment.

3 DEVELOPMENT OF THE MDR AS A STRONG EXPORT-ECONOMY SYSTEM (LOCAL PROCESSING OF AGRI-, AQUACULTURE & FORESTRY PRODUCTS)

Creation of new centers of socio-economic development through accentuating potentials of MDR's fertile soil, a developed regime of aquaculture and agriculture that work hand-in-hand with urban and processing centers for each of its six agro-ecological zones (Hong Ngu, Ha Tien, Rach Gia, Cant Tho, Bac Lieu and Ca Mau), in addition to in the other 9 provincial capital cities in the MDR (Tan An, Cao Lanh, Long Xuyen, My Tho, Vinh Long, Ben Tre, Tra Vinh, Vi Thang and Soc Trang).

4 SPATIALLY RESPOND TO SEA LEVEL RISE (CLIMATE CHANGE AS A THREAT & OPPORTUNITY)

Develop three major urban and rural morphologies, as a system of wet and dry areas defined and derived from soil types, sedimentation, erosion and subsidence, with the 2050 predictions of inundation and saline intrusion. An ‘extended Plain of Reeds’, type is developed as controlled flooding and water storage. Housing and other building types would be developed as floating and /or on stilts in order to work with the severe water conditions. Fish farming indigo farming and other activities that can flourish in such extreme environmental conditions, would be strengthened.

A ‘freshwater alluvial type’ would be developed for the Trans Bassac Depression and the Freshwater Alluvial zones where a requalified system of urbanism on relatively highland would work together with a diversified productive landscape of rice, orchards, vegetables.

A ‘coastal areas’ type would be developed for the Eastern Coastal Zone, Ca Mau Peninsula and the coastal part of the Long Xuyen Quadrangle to form part of a more dynamic and robust coastline, with sea dikes moved further inland and massive mangrove afforestation. Settlements would be developed to work in section. Within this setting of new mangroves and water bodies a new and complementary aqua-cultural economy could be built with a larger emphasis on harvesting naturally renewable resources and high-end specialized products.

5 RE-ENGAGEMENT WITH DYNAMICS OF NATURE (SUSTAINABLE DEVELOPMENT)

Consciously re-engage with the dynamics that nature and water in particular. The main operation of the revised Mekong Delta Regional Plan is to predict the optimum water-land interplays in light of climate change. The basic unit of the plans 120 water compartments, 6 sub-regions, 3 broad landscape types, the selection and layout of infrastructures all have to do with these new water conditions. They deliver the register.

6 WATER-AND-ROAD AS WARP-AND-WOOF (INFRASTRUCTURE DEVELOPMENT TAILORED TO SPECIFITIES OF MDR)

Water and road infrastructure must be complementary and new infrastructure cannot be built where there anyways will be inundation. A rebalance of road transport with water transport, for passengers and cargo is necessary. It remains a simple fact that canal construction and maintenance is many times more economic than road constructions given the particular, unstable soil composition within the Mekong Delta.

The Revised Mekong Delta Region Plan

Responding to Climate Change

The revision of the plan for the Mekong Delta Region sees climate change (and the way it reconfigures the geography of the territory) as an opportunity to realign the plan (and consequently development) more with the (changing) characteristics of the territory. How to organize a constructive interplay between landscape dynamics and the social, economic and cultural dynamics of the region? That is, the main question of the new proposed master plan. The main asset of the delta (surely in view of the expected worldwide food shortage) remains its enormous agri- and aqua-cultural potential. Such a territorial identity is largely the outcome of the interplay between land and water, or more precisely: topography (including bathymetry), soil qualities (most broadly alluvia, saline and acid sulphate) and conditions and salt and fresh water parameters (volumes, qualities (including carried sedimentation), heights and extents, tides and seasonal variations). Recognition and accentuation of the delta's underlying geography, which has been classified into six broad agro-ecological zones (excluding the seven hills and mountainous area near the Cambodian border), can re-establish its core identity, counterbalance the relative homogeneity of the region's urbanism and re-articulate the productive landscapes of the delta's dynamic ecological zones.

The Vietnamese predicted consequences of climate change by 2050 (SIWRP 2012), which in general will create more extreme conditions, will inevitably strengthen the differentiation between the six sub-regions. The regions include three coastal zones along the East Sea and Gulf of Thailand where saline intrusion will drastically change vegetation and urban as well as agri- and aqua-culture development potentials (the Eastern Coastal Zone, Ca Mau Peninsula and the Long Xuyen

Quadrangle); the Plain of Reeds (Dong Thap Muoi floodplain) (500,000 ha), the major catchment basin and lowest elevation of the delta (0.5 meters below mean sea level), located along the northern border with Cambodia—popularly known as the Plain of Reeds—where profound inundation will extend; and two centrally located regions, the freshwater alluvial and Trans-Bassac zones, which will remain relatively 'safe' from both saline intrusion and inundation.

These six sub-regions define major differentiation in the identity of the Mekong Delta Regional Plan. Each of the sub-regions has its own characteristics due to primarily to its soils and hydrology, and the revision of the plan advocates the anchoring of development scenarios on these distinctions, which in the end can be considered as natural locational assets. Evidently, the provinces each define a further level of differentiation, but finally the water management units (120 in total, on average 20 by sub-region, or 9 in each province) are of strategic importance, since water regulation (controlling quality and quantity of water) defines, through compartmentalization, the territory. At an even lower level, the drainage structure and parcel(ation) system define the mesh of the mosaic landscape, but it is clear that it is the 120 water management units that define, in addition to the six sub-regions, the most important scale of differentiation in the landscape (whose agri- and aqua-cultural exploitation in the end is determined by the water management).

Urban & Rural Morphologies

The Mekong Delta Regional Plan develops three major urban and rural morphologies, as a system of system wet and dry areas, are defined and derived from soil types, sedimentation, erosion and subsidence, as well with the 2050

predictions of inundation and saline intrusion. A first, 'extended Plain of Reeds', type would be developed for Dong Thap Muoi and part of the Long Xuyen Quadrangle. The area is expected to be significantly inundated as time marches forward and thus the region can once again thrive as an area of controlled flooding and water storage. Housing and other building types would be developed as floating and / or on stilts in order to work with the severe water conditions. Fish farming indigo farming and other activities that can flourish in such extreme environmental conditions, would be strengthened.

A second, 'freshwater alluvial type' would be developed for the Trans Bassac Depression and the Freshwater Alluvial zones where a requalified system of urbanism on relatively highland would work together with a diversified productive landscape of rice, orchards, vegetables.

Finally, a 'coastal areas', type would be developed for the Eastern Coastal Zone, Ca Mau Peninsula and the coastal part of the Long Xuyen Quadrangle to form part of a more dynamic and robust coastline, with sea dikes moved further inland and massive mangrove afforestation which would allow for a better mix of saline and freshwater systems, provide protection against the increasing threat of storm surges and as well allow for a more sustainable aquaculture economy. Mangrove afforestation can speed up the gaining and consolidation of land by natural sedimentation processes at the coast of the East Sea and the Gulf of Thailand. Settlements would be developed to work in section with the East Coast's parallel and alternating rows of sand ridges and backswamps, successive peat layers and subsiding lands of the Ca Mau Peninsula. Within this setting of new

mangroves and water bodies a new and complementary aqua-cultural economy could be built with a larger emphasis on harvesting naturally renewable resources and high end specialized products, such as rare medical plants. As such, these additions to the—until now largely mono-cultural—economy will strengthen the robustness of the economy and the sustainability of the development of the Mekong Region.

Infrastructures of regional importance and their multiplicity

Rivers and canals play a predominant role in the functioning of the MDR. Canals were particularly important to allow (amongst others) \movement perpendicular to the predominant orthwest-southeast direction of the Mekong River branches. In that sense, the canals unified the MDR in terms of connectivity. Since the beginning of the twentieth century and step-by-step development the canal system has been complemented with a road system, that are typically traced parallel to and close to the canals. Often, these roads are flanked with by now fully grown monumental trees. Also canals are often flanked by trees.

Traditionally, populations in the Mekong Delta settled on the natural levees of waterways, creating a river-water civilization. Drainage canals enabled a 'river-water' or 'canal-creek' civilization to develop linear settlement structures, following the alluvial, unsalinated, high-land banks of waterways while the swampy area of the delta was transformed into fertile alluvial plains for wet paddy cultivation. Life was dependent on the rhythms of river water regimes. Engineering, modernization and strong policies significantly changed the relation of living to water. However, the realities of climate change are forcing both new policies and new everyday practices to

once again relate back to the rhythms of river water regimes. The age-old nuance of the Vietnamese language is becoming relevant today in its inherent sensitivity towards living with water: it distinguishes between several kinds of floods: *lu* (flood), *lut* (inundation) and *ngap* (submergence). Floods occur when excess water upstream flows over riverbanks or dykes to floodplains. Inundation is affected by floods. Submergence is a phenomenon that occurs when water levels in the plain (fields or land of the inner dyke or depression areas or wetlands) are higher than the ground surface area. Inhabitants of the Mekong Delta call the yearly September-October flood period *mau nuoc noi* (water rising season) and *nuoc son* (reddish water) referring to the water color of heavily silt-laden water from upstream. *Nuoc bac* (silver water) refers to greenish and transparent water that flows from fields with acid surface soils [Le et al. 2007:27]. Despite the apparent move towards a road-based society, the Mekong's river-water civilization persists. It is inherent to the delta and the compulsory behavior of planners and politicians that give in to the seduction of the car and seemingly progressive economic policies, ultimately cannot change the nature embedded in a territory that began as—and fundamentally remains—a swamp. In the end, it all necessarily, comes to water (management) in this region.

During the last decade(s), policy has emphasized the new highway system that is superimposed on the territory and that fundamentally increases the connectivity regionally, nationally and internationally. The existing national road and canal system remains, however, of fundamental importance. As such it is one of the main existing manmade structures that functionally unifies the region and is a critical element in the regional identity.

It is neither feasible, nor recommendable to replace the entire existing road system with an express road or highway system as it is anyways unaffordable.

As historically, the road and canal system was most often has been realized in parallel; the roads and canal bundles function in practice as a spatial unity that combines multiple functions and meanings. They evidently function as traffic corridors, but also operate as collectors of functions of all kinds. Social, economic and other facilities are built along them. The canals are simultaneously irrigation instruments and ecological systems. The embankments of the canal have a role in security and very often accommodate interesting mixes of vegetation, with the already mentioned monumental trees as a base, but also plenty of complementary species that grow spontaneously. In the countryside, and in general, the embankments that simultaneously define the space between canal and road are the only spaces that are not exploited for agri- or aquaculture. As such, they belong to the very few spaces in the completely domesticated MDR where (nature and) ecology can take the lead. In that sense — and because it concerns, de facto, an extensive system of longitudinal strips — they also define an elaborate ecological frame for the entire MDR that weaves itself into the majestic blue network as if it were part of a warp-and-woof.

The embankments sometimes become public spaces. This is more often the case in cities, of course, than in the rural context. Ribbon development that encroaches on the (in principle public(ly owned)) embankments of the canals and along the parallel roads is a major threat to the ecological value of the system. Moreover, it implies less efficient traffic less and decreases road safety. Above all, these

encroachments are a burden for maintenance and jeopardizes the modernization of canals and roads.

However, maintenance and modernization is crucial to accommodate the long-term transport needs and water management requirements, to safeguard and re-establish ecological values, to adapt to climate change impacts and to secure safety. The systemic widening and deepening of canals and raising, strengthening and replanting their embankments (while clearing from encroachments), while improving roads is necessary to answer to these challenges.

All this requires a fine-tuning of the long-term investment programs of both the state and the provinces, but also a change in the content of the current plans. Often necessary road widening is realized by filling in adjacent canals, a practice that weakens the water and ecological systems and decreases the spatial and livelihood quality. Until now, road and canal construction are managed by separate administrations and executed as independent, unrelated issues. As argued before, the bundles of canals and roads form a unity with a multiplicity of uses and meanings and, consequently, has to be conceived as a whole that safeguards this multiplicity.

Many places in the MDR have impressive amounts of rural paths for motorcycles, paved and unpaved. Most of them are located along canals or river branches. The effect of this opening up of the countryside is remarkable and greatly contributes to the development of the communities of farmers in the countryside by strengthening their links with the cities (and markets). As such, these path networks are essential instruments in the consolidation of urban-rural exchanges (and in that sense

of the urban-rural continuity). It is obvious to remark how this opening up of the countryside (for motor cycles) also catalyzes development that uplifts the comfort and living standards in the countryside. In general a shift in building regulations (ground floor levels for example) and an increase in their enforcement is required to canalize the construction boom and safeguard ecological qualities and guarantee qualities. Industrial zones can also be imbedded within forests (and parking areas can be planted with trees) infrastructure (canals and roads) should also have tree lines. In short, multi-use is necessary since there is no space to zone everything that has claims on space.

New infrastructure for the Mekong Delta Region Plan is reconceived in light of climate change and vulnerability of territory. The deliberate choice is not to build new, extremely expensive infrastructure where there anyways will be inundation. A number of planned highways by the Ministry of Transportation couldn't be optimal investments, if they were going to be already flooded by 2050. The plan proposes to create connections not as equal access and a homogenous grid across the territory, but instead a hierarchical system with a main highway collector, a central spine located on guaranteed dry land in the center of the delta and feeders, or linkages to important socio-economic destinations, including Ho Chi Minh City, the TransAsian Highway, ports and transversal to Vietnam's border gates. The further from the spine, the more modest the profile of the feeders (and probably the more natural structures such as mangroves and water elements would take over as structuring devices of the territory). The plan would also very importantly stress and rebalance road transport with water transport, for passengers and cargo. It remains a simple fact that canal

construction and maintenance is many times more economic than road constructions given the particular, unstable soil composition within the Mekong Delta.

Socio-Economic Development

The Vietnamese State invests in the Mekong Delta by the direct execution of national infrastructures, but mainly by the allocation of means to provinces and cities (such as Cantho), what leads amongst others to competition between provinces and to the multiplication of stereotypical, often oversized infrastructures such as industrial zones, ports, roads, airports, etc.

The Mekong Delta Regional Plan advocates: 1) investments that are better sized and more tailored to the specificities of their localities in order to anchor further economic and social development more on the articulation of six agro-ecological regions; 2) prioritizing investments than enhance endogenous development instead of attempting to attract generic international investments for whom low labor costs; 3) increasing impacts of investment by creating more synergies between different investments; 4) concentrating means in a few key projects that operate on the scale of the Mekong Delta as a whole and that contribute to the development and its identity.

As the population of the MDR are expected to grow from 2015 until 2050 to just over 19.5 million inhabitants and given the expected social and economic development, the creation of a new international airport might be considered. There is also a potential demand for an international deep seaport. In case of the realization of the Kra canal, a well-positioned international deep seaport can exploit the redirection of major shipping routes. It is

evident that these new infrastructures, that would require major national investments, would greatly contribute to the future identity of the Mekong Delta. They are major flagship projects.

State-of-the-art Land Reclamation for Airport and Port

To increase feasibility and generate synergies, the Mekong Delta Regional Plan proposes to integrate these flagship projects in an operation that simultaneously increases coastal protection in the light of sea level rise through a new type of land reclamation program.

This way, the key projects neither require (any) land expropriation nor imply the loss of valuable productive land (which remains the main asset of the Mekong Delta). They will, on the contrary, be embedded within a land reclamation program that offers, besides space for ecological development (coastal protective mangrove afforestation) various water and land variations that can accommodate new farms, fish and shrimp farms, oyster banks and other seafood nurseries that can be combined with new sustainable coastal settlements and new state-of-the-art fishery ports.

The Mekong Delta Regional Plan proposes to enhance a controlled and increased sedimentation along the East Sea in order to drastically scale up the natural land winning process. Systematic implantation of obstacles (breakwaters) on the subaqueous delta platform would break the streams. As such they are already efficient coastal protection devices. They, moreover, slow down the water current and halt it locally. This strongly enhances sedimentation and consequently initiates, by itself, an accelerated formation of sand banks that ultimately results in a

land gaining process, which can be further consolidated by the systematic planting of mangroves. This will not only strengthen the ecological structure of the Mekong Delta, but also increase its resilience in case of storms.

The proposed process can be compared with the well-know techniques of dune formation and reconstruction through the placing of windbreaks and its consolidation through adapted plants. The main technical issue of the land-gaining program defines the design of the 'obstacles' (breakwaters), the distribution pattern that would be tailored in relation to dominant water current directions and their variations and the indicated openings and distances between the obstacles. The optimization of these parameters would steer the design that can be adapted to the dynamics of the sea and desired land formation and targeted interesting alterations between water and land, deep and shallow water, etc. These variations would allow the creation of optimal conditions for a variety of habitats (shrimps, oysters and other seafood, fish, birds, plants, wood, etc.)

Differentiations in the shape and depth of the breakwaters, distribution pattern and orientation and distances in between the breakwaters will allow to generate a variety of water- and landscapes and could includes new waterways of various characters. The technique can be applied both in areas along the East Sea that already today naturally gains land (and speed up the process there) as it can be applied (while intensifying density and dimension of breakwaters as coastal defense system in areas nowadays suffering from erosion.

This principle of almost natural, but accelerated land creation might appear

farfetched, but in the end it merely capitalizes on (in turbo version) the natural processes of land formation (and erosion) that simply exists throughout the entire MDR. When it comes to it, the Mekong Delta is indeed one gigantic, unstable mud plain that oscillates between being ground and water, land and sea. Hence, there is actually no real or precise shoreline, but an entire territory that should be considered as one extended shoreline.

Moreover, the land creation program offers the possibility to regenerate ecological conditions that originally characterized the MDR and that now have been given over to the extensive mono-cultural agricultural landscapes that replaced almost the entire territory. The land creation program offers in that sense the chance, as a start of a long-term transition for the whole MDR towards sustainable forms of exploitation of natural resources, to experiment on new and still unclaimed land.

In theory, the land-gaining program can be applied along the whole East Coast south of the estuary of the Hua River without being disruptive or being disturbed by river flows themselves. It is evident to organize a gradual process that starts with a more punctual and local interventions in order to gain experiences and test the variables of the program.

As already mentioned, a region that will grow to nearly 20 million inhabitants and with a great economic potential, there is a sufficient base for an international airport that serving the whole region (making it less dependent on Ho Chi Minh City). The land gaining program sketched above is actually an interesting possibility upon which can be anchored the realization of an (offshore) international

airport, as it would offer evident synergies.

The offshore construction of airports is increasingly becoming, for good reasons, an international practice. It is surely indicated in densely inhabited and intensively cultivated territories as the Mekong Delta where any loss of productive land and the massive displacement of farmers has to be avoided as much as possible. Kansai Airport (Japan) is only one of the many references in this regard, in addition to Hong Kong's Chek Lap Kok Airport, Incheon Airport (Seoul, South Korea), New Kitakyushu, Kobe, Chubu and Osaka (all in Japan), Dalian (China), Bornholm (Denmark), etc. All of these experiences have contributed to the necessary techniques which make them flood, typhoon, and subsidence resistant.

It is evident that the realization of an off shore airport simultaneously could be used as a catalyst for the land creation program and vice versa. It is not difficult to imagine the synergies that could be created between these two plans.

The same synergistic potential is there with the construction of an international deep seaport. The construction of this port would (as is the case for the airport) catalyze the land creation program and vice versa. The optimal location for a deep-sea port is evidently at the edge of the subaqueous delta platform, because quay positioned on the subaqueous delta slope would guarantee that dredging the harbor would never be necessary while constructions on the subaqueous delta platform (between the coast line and the subaqueous delta slope) — which in nautical terms has limited depth, remains feasible.

The Mekong Delta Regional Plan proposes to locate the deep seaport at the latitude of

Bac Lieu (which is sufficiently south of the estuary dynamics of the Hau River while simultaneously being well located in the travel stream of freight and cargo from international maritime routes (that without doubt will increase exponentially in case of realization of the Kra canal), deliver logistical services to ships of these maritime routes (comparable with Singapore). The new deep seaport would, and this in opposition to Singapore, also be the natural port of a large natural hinterland (the whole MDR and Mekong Basin in Vietnam, Cambodia and more upstream). This entire hinterland can be served by water transport, supplemented with new road (and railway) infrastructure. Combining the infrastructure that organizes the sea and airport accessibility will realize substantial economies.

To increase synergies and economies, the Mekong Delta Regional Plan proposes to track access infrastructure to sea- and airport as an prolongation of the planned (and partially realized) Trans-Asian Highway. The southern end of this international highway would be reoriented towards Bac Lieu (instead of Ca Mau and further south) as it is projected now.

Finally, Offshore wind farms can easily be anchored on the realization of the international off shore air- and deep seaport and contribute substantially and sustainably to the massively growing energy demand of the MDR. Today, the first phase of a 83.2 MW offshore windmill farm, the Bac Lieu Province Wind Plant, Power Plant is already operational. The Mekong Delta Regional Plan proposes to foresee the extension of this power plants and to make them part of an integrated strategy for off shore development of land, water bodies, settlements, seaport and airport.

The gradual and long process of land creation will, besides reconstruct ecologies, generate

a multitude of sustainable and renewable resources (fish and seafood farming, wood, etc.). Sustainable and smart settlements can develop to exploit these resources in new experimental ways along the new coastal area that can simultaneously become models for the long-term transition of the coastal agro-ecological region and the Ca Mau peninsula.

For efficiency reasons and to enhance feasibility, the Mekong Delta Regional Plan envisions the future of such smart coastal settlements to be predominantly water-based. Roads would be limited to the absolute minimum (the access system to the deep sea port and airport).

Re-engaging Nature

The Mekong Delta Regional Plan is a first step-stone to consciously re-engage with the dynamics that nature, (and here water in particular) imposes on the territory. It was stated before that the landscape of the Mekong Delta is the result of a managed and choreographed interplay between land, water in all sizes and measures and with all the gradients one can imagine. The main operation of the revised Mekong Delta Regional Plan is to predict the optimum water-land interplays in light of climate change. The basic unit of the plans 120 water compartments, 6 sub-regions, 3 broad landscape types, the selection and layout of infrastructures all have to do with these new water conditions. They deliver the register. The proposal is to graft the further development of the Mekong Delta on this register.

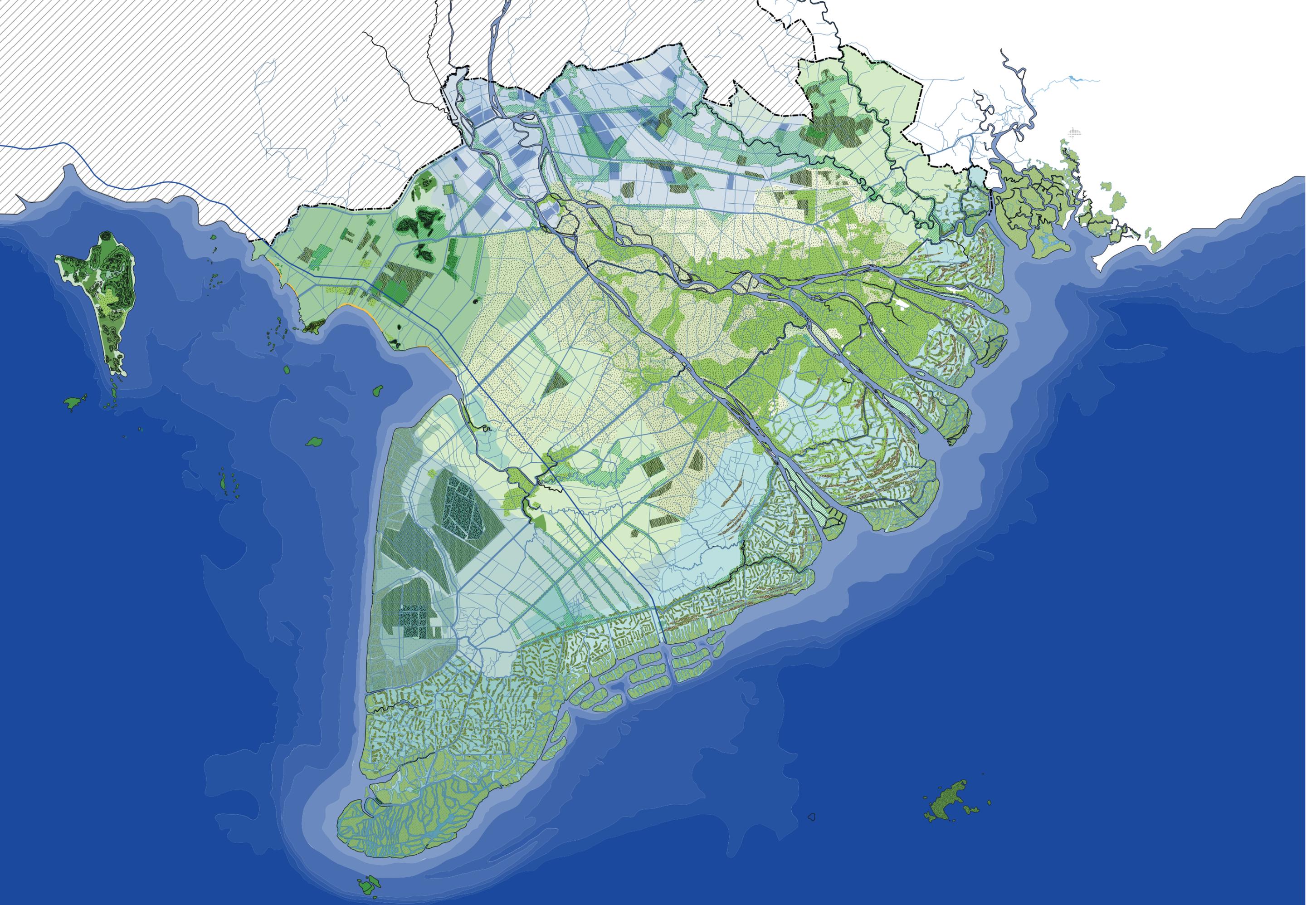
New productive landscapes

The three areas defined by climate change adaptation offer the occasion to rethink the landscape morphology and realize a new productive landscape that constructively interplays with the natural assets of each sub region. The Plain of Reeds will become a region rich with fish farming and other aquaculture, as well as indigo forest products. Rice, orchards and vegetables will continue to thrive in the Fresh Water Alluvial area as well as in Trans Bassac Depression and parts of Ha Tien-Long Xuyen Quadrangle. Aquaculture with mangrove afforestation will develop strongly along the coasts and specialized forests will form new green structures throughout the MDR that complement the forever expanding water networks.

Landscape

-  Salt water mangrove
-  Fresh water mangrove
-  Specialized forest
-  Productive forest
-  Orchards
-  Aquaculture
-  Rice basket
-  Green structure





2050 MDR transformation

The Mekong Delta Regional Plan creates new, innovative and ecologically sound productive landscapes, which are equipped with a performative infrastructural systems of waterways and roads. One central spine, paralleled by two secondary links, organizes as well the connection with Ho Chi Min City and the rest of the country and simultaneously organizes the main movements in the region. The TransAsian highway passes along the Gulf of Thailand and ends in Bac Lieu where a new off-shore deep sea harbor finds a natural location of the subaqueous delta slope. This is also where a new regional airport can be implanted without sacrificing any productive land.

Urban typologies

- Extended Plain of Reeds
- Freshwater alluvial
- Coastal areas

Road infrastructure

- Major highway
- Highway
- National road existing

Landscape

- Salt water mangrove
- Fresh water mangrove
- Specialized forest
- Productive forest
- Orchards
- Aquaculture
- Rice basket
- Green structure



