

Annex S: The Danish Energy Agency

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1. Denmark's energy transition

In the early 1970s, Denmark was completely dependent on imported oil and the 1973-1974 oil crisis hit the country hard. The Danish Energy Agency (DEA) was established in 1976 and mandated to work with Danish research institutions to diversify the energy sector. This had two key results. The first was that investment in North Sea oil and gas development made Denmark self-sufficient in hydrocarbons by 1997 and net exporter for a few years thereafter. The life-span of this industry is unlikely to exceed 70 years, however, as the Danish government decided in 2011 to phase out production entirely by 2050 and in 2020 confirmed that no new exploration concessions will be issued. The second result was that the first subsidies of up to 30% of investment costs, were offered in 1979 to anyone wishing to install wind turbines. Intensive research and development on renewable energy and energy efficiency (RE/EE) followed, and three decades and many adjustments to the support schemes later, Denmark was able to meet all its electricity needs from wind and has significant research and policy expertise in this field.

Denmark was meanwhile exploring commercial and other opportunities in the areas of energy efficiency in buildings, homes and industry, and district heating, resulting in much innovation and the growth of a large export industry based on relevant applications and specialist knowledge. The result of these and other initiatives is that Denmark is now fully RE/EE-enabled and connected with mainland Europe and Scandinavia, with a high-voltage direct current (HVDC) 'Viking Link' under construction between Denmark and the UK¹. In June 2020, Parliament authorised the Danish Climate Agreement for Energy and Industry 2020², the centrepiece of which is the construction of two 'energy islands'³. These will comprise an artificial island in the North Sea with a total capacity of 3 GW, and another development in the Baltic Sea, which will be a hub for offshore wind

¹ <https://www.nationalgrid.com/national-grid-starts-construction-viking-link-worlds-longest-electricity-interconnector>

² [http://en.kefm.dk/Media/C/B/faktaark-klimaaftale%20\(English%20august%2014\).pdf](http://en.kefm.dk/Media/C/B/faktaark-klimaaftale%20(English%20august%2014).pdf).

³ <https://ens.dk/en/our-responsibilities/wind-power/energy-islands>.

farms with a total capacity of 2 GW. The total expected cost is EUR 37 billion, mostly from private investors⁴. Electricity surpluses will be exported or combined with other technologies and used to make carbon-neutral fuels, or for carbon capture and storage. These energy islands have the potential to contribute significantly to meeting the EU's goal of at least 300 GW of wind energy generation installed by 2050.

Danish products are available across the expanding clean energy sector, including energy-efficient pumps, variable drive components, heating, ventilating, and air conditioning (HVAC) systems, insulation and building designs. All feature in city-level partnerships that are being developed, for example between Buenos Aires and Copenhagen (Annex T). They are also prominent among Danish offerings on Green Denmark platforms⁵. By matching the rapidly-growing need for RE/EE with available Danish resources, the Danish embassies can promote trading partnerships that contribute to the climate emergency response, thus complementing more direct and impactful actions that Denmark is also taking through the DEA in many places.

2. DEA's responsibilities, capacities and priorities

The DEA is a specialist agency under the Ministry of Climate, Energy & Utilities (MCEU). The DEA itself has divisions for Utilities and Supply, Subsoil Resources and Risk Preparedness, Global Cooperation, Renewable Energy, Telecommunication, System Analysis, Energy Efficiency, and two aspects of Energy Administration. This structure reflects its diverse responsibilities, which include tasks linked to energy production, supply and use, including the economic optimisation of utilities such as water, waste and telecommunications through user conditions and supply obligations, as well as for Danish efforts to reduce carbon emissions.

The process of achieving the national energy transition has created a very substantial Danish capacity in multiple sectors related to R&D and commercialisation of RE/EE techniques and technologies. The possession of such expertise in depth puts Denmark at an advantage in a world that is now urgently investing in RE/EE technologies under threat of climate breakdown. This in turn has encouraged the idea that Denmark should focus on promoting RE/EE as its primary contribution to GHG emission reductions worldwide. As the technical agency responsible for orchestrating the Danish energy transition on behalf of government, DEA and its growing staff of more than 500 is the key knowledge holder in this area. It has a key role in offering its energy sector expertise to other countries, in association with Energinet, RISØ/DTU and other technical institutions in Denmark.

The Danish government established the Climate Envelope in 2008 under MFA oversight and joint management with MCEU, the aim being a climate response in which the RE/EE and other themes would be integrated. The DEA had already developed capacity for international engagement on behalf of MCEU, by offering services in support of international negotiations, funding and feed-in pricing, energy statistics, and publications,

⁴ <https://www.irishtimes.com/business/energy-and-resources/denmark-plans-giant-37bn-energy-islands-as-part-of-green-programme-1.4259280>.

⁵ E.g. www.greendkinsea.com.

maps and analyses. One result of the energy transition in Denmark is that the country was the first in the world to manage its national grid entirely with fluctuating wind energy. It is a hard technical challenge to adapt a grid designed to handle continuous electricity feeds so that it can use more variable ones, yet this must be done by any country in transition to RE and Denmark can help with this.

Since 2012, DEA has actively developed this international theme, starting with stand-alone projects and building a portfolio of 3-5 year country programmes that are now packaged as DEPPs, of which the latest version is the 2020-2025 DEPP III in China, Vietnam, South Africa and México (MFA & MCEU, 2020b), and a similar programme known as IndoDEPP in Indonesia (MFA *et al.*, 2020). The DEA is now responsible for 16 partnerships with high-, middle- and low-income countries (Figure 1). These were generally initiated at the request of the governments concerned, usually because they saw value in one or other kind of RE that suited their national circumstances (e.g. onshore wind in Ethiopia, offshore wind in India, district heating in Turkey).



Figure 1: DEA partnerships in 2020 (www.energystyrelsen.dk).

It was stressed by DEA interviewees that it is not possible to advise a country on one of these RE forms in isolation, without also addressing issues across the whole energy sector, including policy, law, markets, finance, capacity building, and technology.

3. Design and performance of DEA overseas engagements

a) *The sampled interventions*

Sources of information for this review are given in Annex a, and some of the DEA engagements were in the four focal countries of the evaluation and are listed in Annex b. Their general aim was “to share best practice from decades of green transition in Denmark through government-to-government cooperation to increase the speed of

global green transition.”⁶ Findings are summarised in Annex c, and details are available in Annexes H-K of the Main Text (on Ethiopia, Indonesia, South Africa and Vietnam respectively). Some aspects of design and performance among the sampled interventions stand out in the evidence-based scoring reported in Annex c. These patterns should be seen as ways to draw attention to some issues for further examination, without forgetting that other issues exist that will not be detected by this means and must be clarified through contextual research.

b) Issues of purpose and performance

Because of the background in Section 2, a starting point for DEA engagements would be expected to be that DEA and its key Danish collaborators have solved the problem of how to integrate variable RE safely into a national grid, and that this expertise was being sought by countries that had invited Danish involvement. The engagements should therefore have been rather straightforward to explain in the project and programme documents, yielding high scores for design quality. This was only seen in Indonesia and Vietnam, however, where both countries had clear policies in favour of RE/EE, and they then differed markedly in performance. This is curious because high design scores are often linked to high performance score. The difference between them is thought to be that in Indonesia RE/EE was a secondary priority of government as a whole (although a higher one for the particular ministry concerned, MEMR, and for sub-national governments) - resulting in slow implementation of RE/EE reforms at national level and, hence, low performance scores at that level. In Vietnam, by contrast, RE/EE was a truly national priority, resulting in high performance scores overall.

Relatively weak design and performance scores in South Africa reflect the divided priorities of government in the area of RE/EE, which was politically vexed due to coal interests intersecting with the chaotic circumstances of a particular period in the country's history. This entanglement at national level could perhaps have been evaded by working directly with large municipalities such as Port Elisabeth and Cape Town, that were interested in developing wind energy, or else the mining municipalities to meet the local challenge of potential mass unemployment among coalminers.

Low scores in recent interventions also reflect the late arrival of DEA on the scene relative to the growth of the South African wind energy sector. Where Danish involvement later made a real difference, in the integration of wind energy, this was handled by Energinet with Eskom rather than by DEA with DMRE, so its success is not detected in Annex c here (but is picked up in the Main Text). There is a similar story in Ethiopia, where the better-performing Engagement 1 of AWPGE is not detected in Annex c, leaving DEA responsible only for the weaker Engagement 2. Thus, the problem is not with Danish engagement as such, but specifically with the targeting of DEA engagement in non-technical areas.

In all these cases, the message is that ideally a clear technical need should be matched with a clear technical delivery plan, with the correct institutions matched in their political economy context and working together for a common purpose. Where this occurs the

⁶ www.ens.dk/en/our-responsibilities/global-cooperation

scores for design and all aspects of technical performance are typically high. But if non-technical needs are added to the mix by the partner government, then a partnership may be attempted by institutions with ill-matched expectations and capacities. In this case, the scores for design and all aspects of technical performance are likely to be low.

c) *Issues concerning capacity building*

Building capacity is not just about transferring specific skills, but rather about building the ability of an institution and its staff to analyse, understand and formulate strategies and tactics for solving diverse problems. Two effective ways to do this are known:

- by embedding within the target institution long-term advisers who can transfer knowledge, insights and skills to many colleagues slowly over time, while also acting as portals for engagement with external stakeholders⁷; and
- by concentrating multiple sources of new knowledge in a small social system energised by a local priority, including demonstration projects, participatory studies, and knowledge exchange with other places and peoples⁸.

The first was done in Vietnam, with the result that capacity building scores there stand out. The second was through an emerging process in Lombok, Indonesia, which is the other area where high capacity building scores were found. Detailed 'before' and 'after' documentation is lacking in these cases, along with the capacity assessments and plans needed to allow progress reporting, but the pattern observed makes sense. Neither of these two known strategies are fulfilled by the mainly short-term TA inputs that characterised most DEA engagements in Ethiopia and South Africa, and this is reflected in low scores for this aspect of performance.

d) *Issues concerning partnerships*

A genuine partnership is marked by the partners exchanging diverse resources (money, influence, ideas, support, policies, capabilities, etc.) in a transparent, intimate and fully conscious way over an extended period, in order for both to benefit by becoming better at doing what they both want to do. It is, therefore, an alliance of equals who agree to exchange things that both need on terms freely negotiated in a spirit of friendly cooperation. Among the DEA interventions in South Africa, Ethiopia and at national level in Indonesia there were signs of a policy-priority misalignment, possibly combined with a failure to engage fully by the top and mid-level leadership in each country's institution (or in the case of Indonesia, above it). In these circumstances, new ideas and skills obtained by lower-level staff cannot lead to supportive changes at the institutional

⁷ For example, state institutions may find it hard to recognise and accept the needs and knowledge of community and private actors (e.g. during a transition from state monopoly to a multi-market), correcting this through stakeholder engagement is a key aspect of capacity building.

⁸ As has been seen in many other locations, for example in Guyana as a result of the Iwokrama initiative, in the University of the Philippines at Los Baños as a result of the ASEAN Centre for Biodiversity, and in Costa Rica as a result of the national biodiversity inventory (see: *Designing Conservation Projects* and *Aid Performance and Climate Change*, by Julian Caldecott, Cambridge 1996 and Routledge 2017 respectively).

level, so these partnerships had no chance to develop fully. The following positive points can also be made:

- that DEA partnerships *of any kind*, as long as they enable policy dialogue, with 16 countries that together account for more than 60% of the global GHG emissions, are a hugely important resource for mitigation influence;
- that in Vietnam, Danish programme support is valued because of its budgetary impact, its adding of specific technologies and designs, and its responsiveness to new needs;
- that in Ethiopia, there was good collaboration between the Ethiopian Minister of MoWIE and the Danish Ambassador, leading to common Danish-Ethiopian positions in UNFCCC meetings;
- that in Indonesia, the SSC Energy, SSC Environment and SSC-SII actions on Lombok are synergistic and welcomed by sub-national government; and
- that in South Africa, the non-DEA WASA engagement resulted in lasting partnerships between Danish research institutions, including those allied to DEA, and South African ones, which compensated for the lack of partnership at the ministry level.

4. Conclusions

The DEA is a knowledge-management agency that provides know-how advice and design, installation, operating, monitoring and reporting standards across the RE/EE theme. The latter is diverse and, in a world needing to decarbonise urgently, the DEA is an important enabler of change. It is reasonable to expect that all countries will seek to continue to grow economically and to need more electricity, and that this should come from RE sources, with sources diversified for energy security, attention to externalities, and minimisation of demand through EE. Since 2012, Danish mitigation strategy has involved promoting RE/EE through an expanded DEA presence in multiple countries, with the support of MFA. The following conclusions were drawn.

- **From Section 1**, that Denmark is in an exceptional position to offer useful technical support to other countries that wish to decarbonise their energy sectors by expanding their RE supply and EE capacity.
- **From Section 2**, that DEA has built since 2012 a network of agreements with diverse countries, and in practice these have tended to engage across a broad range of issues from narrow technical matters to sector-wide engagement.
- **From Section 3.2**, that successful engagements are those that remained focused at a technical level, and/or that targeted specific technical needs at sub-national level, and/or that broadened only in response to strong national direction. There was effective delivery of technical skills, but there was sometimes inadequate targeting of the best point of technical and/or sub-national engagement.
- **From Sections 3.3 and 3.4**, that successful engagements are those where the leadership in the partner institution is involved directly in learning and practicing new skills, usually because national policy requires them to do so, but weaknesses in impact tended to occur where training targeted only technicians who had little

influence over institutional practices. There was effective delivery of technical skills, but there was sometimes inadequate targeting of the best level of each institution, considering the policy and political economy environment.

Annex a: Information sources for the review

This review is based on the individual project and program reviews in Main Report Annexes E-H (Ethiopia, Indonesia, South Africa, Vietnam respectively), and interviews associated with them, supplemented by an interview with DEA knowledge holders (**Andreas Karlsen, Marianne Ramlau, Elisabeth Søndergaard Krone and Ole Emmik Sørensen**) on 4 January 2021. Other sources included: www.ekf.dk/fremtidfond; www.ens.dk; www.greendkinsea.com; and www.winddenmark.dk.

Annex b: Evaluated interventions with significant DEA involvement

Country: intervention name	Reference	Timeframe	Channel	Budget (DKK million)
Ethiopia: AWPGE - Accelerating Wind Power Generation in Ethiopia	#2016-9613	2017-2020	Climate Envelope (CE)	35.0
Ethiopia: SESC - Strategic Energy Sector Cooperation	#2020-7551	2020-2023	Non-CE	10.0
Indonesia: SSC Energy 1 & 2 - Strategic Sector Cooperation on Clean Energy, Renewable Energy and Energy Efficiency, Phases 1 & 2 (each with national and Lombok focus)	#2015-26760 & 2015-56019	2016-2018 (1) 2019-2021 (2)	Non-CE Non-CE	Phase 1: 5.5 Phase 2: 10.0
South Africa: DEPP 'I' - Danish Support to Renewable Energy Development	#104.G.15-19	2013 - 2015	CE	40.00
South Africa: DEPP II - Danish Energy Partnership Programme with components at DMRE and Eskom	#2017-18831	2017 -2020	CE	18.19
Vietnam: LCEE/DEPP 'I' - Low-Carbon Transition in the Energy Efficiency Sector	104.Vietnam.820/ 2015-53518	2013-2017	CE	65.0
Vietnam: DEPP II - Vietnam-Denmark Energy Partnership Programme	Vietnam 2017- 18831	2017-2020	CE	22.6

Annex c: Design and performance scores of evaluated interventions

Country (code): Intervention	Design	Impact	Effect-iveness	Effici-ency	Sustain-ability	Capacity building	Mean
ET: AWPGE Engagement 2 (RE integration, market reform, service delivery)	3	2	2	3	1	3	2.3
ET: SESC	5	-	-	2	-	2	3.0
Mean (Ethiopia, ET)	4.0	2.0	2.0	3.0	1.0	2.5	2.6

RI: SSC Energy 1 national	5	4	3	5	4	3	4.0
RI: SSC Energy 1 Lombok	5	6	5	5	6	5	5.3
RI: SSC Energy 2 national	5	4	3	5	4	3	4.0
RI: SSC Energy 2 Lombok	5	6	5	5	6	5	5.3
Mean (Indonesia, RI)	5.0	5.0	4.0	5.0	5.0	4.0	4.3
SA: DEPP 'I'	3	3	4	3	3	3	3.2
SA: DEPP II DMRE	3	2	1	2	2	2	2.0
SA: DEPP II Eskom	3	5	4.5	5	5	4	4.4
Mean (South Africa, SA)	3.0	3.3	3.2	3.0	3.0	3.0	3.2
VN: LCEE/DEPP 'I'	5	6	6	6	6	4	5.5
VN: DEPP II	4	5	6	5	5	6	5.2
Mean (Vietnam, VN)	4.5	5.5	6.0	5.5	5.5	5.0	5.3
Overall mean	4.2	4.3	4.0	4.2	4.2	3.6	4.1

Notes:

- Countries: ET = Ethiopia, RI = Indonesia, SA = South Africa, VN = Vietnam.
- Scores: 7 = perfect; 6 = excellent; 5 = good; 4 = moderate; 3 = weak; 2 = very weak; 1 = extremely weak.
- Sources: Main Report Annexes H-L (Ethiopia, Indonesia, South Africa, Vietnam respectively).