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# Towards Environmentally Conscious Publishing

Rebecca Vaa



DANSKE  
**FORLAG**  
Danish Publishers



# Foreword

Danske Forlag has dedicated special attention to an agenda for 'green' publishing. To this end, the board has established a committee with the task of researching and proposing a set of recommendations for the advancement of the industry's green profile. The following report is the result of this work.

The committee for green publishing includes representatives and experts from various actors in the book industry, including publishers, logistics, and book retailers.

Amongst others, the committee is comprised of representatives from three of Denmark's largest publishers: Lindhardt og Ringhof, Gyldendal and JP/Politikens Forlag. The active involvement of representatives from precisely these publishers reflects the board's desire for the largest actors in the industry to bear a brunt of the responsibility in leading the way towards a further green transition. This is a task that builds upon decades of work with environmentally responsible publishing, i.e. by broadening the use of FSC-certified paper in the Danish publishing industry.

The intention of this report and its recommendations is to ensure that the Danish publishing industry actively and truly commits to the collective responsibility for tackling the environmental impacts of book production, thereby contributing to the broader green transition progressing in Denmark and the rest of the world, now and in years to come.

The recommendations presented by the committee are intended to support a true green transition. They therefore emphasise solution-oriented, evidence-based initiatives to be pursued throughout the value chain by Danish as well as international suppliers and business partners.

These recommendations constitute the committee's suggestions for concrete and operational enterprises, which actively support sustainable business practice according to FN's Sustainable Development Goals, particularly regarding responsible production and concern for the environment.

In Autumn 2020, the recommendations have been presented to the board of Danske Forlag, who will support the realisation of these recommendations through active engagement. The Danish book industry has already made significant progress with environmentally conscious production, but new technologies and new expectations from both consumers and political actors have presented an opportunity to raise the bar, an opportunity that shouldn't be missed.

We look forward to continuing the work toward producing a greener book for a greener world.

Copenhagen, November 2020

## THE COMMITTEE FOR GREEN PUBLISHING:

- Christian Davidsen, *Produktionschef, Lindhardt og Ringhof*
- Hans Peter Nissen, *Logistikdirektør / Koncernlogistik, JP/Politikens Hus*
- Jakob Larsen, *CFO/Økonomi- og IT-chef, DJØF Forlag*
- Martin Steenberg, *Boghandler, Bog og Idé*
- Morten Ladewig, *Indkøbs- og produktionschef, Gyldendal*
- Tomas Henriksen, *Produktionsleder - Fiktion, JP/Politikens Forlag*

# En grønnere bog i en grønnere verden

## Sammenfatning af rapporten *Towards Environmentally Conscious Publishing*

Med i alt 10 gennemarbejdede anbefalinger sætter Danske Forlag for alvor ”grøn bogproduktion” på dagsordenen i den danske bogbranche. Anbefalingerne er resultatet af en kortlægning af igangværende og mulige tiltag baseret på kendte miljømæssige påvirkninger i hele bogens værdikæde – fra papirproduktion, design og bogtryk til distribution, salg og genanvendelse.

Arbejdet med grøn bogproduktion starter fra et højt udgangspunkt, da der i bogens værdikæde allerede i dag er en lang række tiltag, som understøtter bæredygtig bogproduktion. Først og fremmest er en meget stor del af bøgerne trykt på FSC-mærket papir, og hos trykkerierne har der igennem en årrække været fokus på at minimere de miljømæssige påvirkninger bl.a. gennem brug af forskellige certificeringsordninger og energieffektive løsninger. Den danske bogproduktion er også favoriseret af, at man i Danmark har en stor del af distributionen samlet hos én distributør DBK. Det muliggør optimering ved distributionen af bøger til forhandlere og muliggør fælles indsatser ift. f.eks. retur.

Rapportens anbefalinger understøtter dette allerede igangværende arbejde for grøn omstilling i branchen.

Med anbefalingerne i rapporten anvises konkrete løsningsorienterede tiltag i den samlede værdikæde af både danske og udenlandske underleverandører og samarbejdspartnere. Ambitionen er, at den danske forlagsbranche også i de kommende år udviser et aktivt og reelt medansvar for klima- og miljøpåvirkningen i bogproduktionen og dermed bidrager konkret til den grønne omstilling, som i de kommende år vil tage yderligere fart i både Danmark og resten af verden.

I det følgende opsummeres hovedkonklusionerne i den samlede rapport: ”Towards Environmentally Conscious Publishing” (november 2020). Rapporten er udarbejdet af Rebecca Vaa, stud. MSc i Global Development, i et nært samarbejde med Udvalget for grøn bogproduktion, som består af repræsentanter og eksperter fra forlag, logistik og boghandel.

### Afgrænsning: e-bogens klima- og miljøpåvirkning

I rapportens indledende afsnit afgrænses projektet til alene at vedrøre papirbogen. E-bogen og lydbogen vinder stor udbredelse i disse år, og dette er, som for papirbogen, ikke uden klima- eller miljømæssige konsekvenser. Værdikæden bag de digitale bøger adskiller sig imidlertid så meget fra værdikæden bag papirbogen, at der reelt er tale om et helt andet projekt. I Danske Forlag er det også en ambition at se nærmere på de digitale bøger, men det er i første omgang nedprioriteret – også i en erkendelse af, at den grønne omstilling af digital bogproduktion i høj grad er betinget af faktorer, som ligger udenfor branchens handlerum. Det gælder fx grøn omstilling af serverparker og produktion af elektroniske læseenheder m.m.

## Danske Forlags 10 anbefalinger til en grønnere bogbranche (Afsnit 4, s. 55-64)

### 1. **Design: Udvikling og implementering af guide til øko-design**

Beslutninger i designfasen (valg af format, materialer osv.) har betydning for den miljømæssige påvirkning i hele bogproduktionen. Derfor anbefales det at udvikle en guide til foreningens medlemmer, så der kommer fokus på miljø- og klimapåvirkning i den indledende designfase.

### 2. **Papir: Opfordring til at benytte FSC-certificeret papir**

Papirproduktion er et af de nedslag i værdikæden, hvor der er størst klima- og miljømæssigt aftryk, og det er et vigtigt mål for den danske bogbranche at øge anvendelsen af FSC-certificeret papir. Derfor anbefales det, at Danske Forlag opstiller mål for brugen af FSC-certificeret papir, og at Danske Forlag nøje følger udviklingen.

### 3. **Tryk: Udarbejdelse af guide til valg af trykkeri**

Valg af trykkeri har stor betydning for bogens klima- og miljøpåvirkning. Det anbefales derfor, at Danske Forlag udvikler en guide, som kan bruges af forlagene til at vælge trykkerier, som arbejder med at understøtte grøn omstilling. Udarbejdelse af guiden vil ske i dialog med bl.a. GRAKOM.

### 4. **Emballage: Initiativer til mere bæredygtig emballage**

Det anbefales, at DBK, som er den vigtigste aktør på dette område, sætter fokus på bæredygtig emballage og arbejder for udvikling af emballage i skræddersyede størrelser. Ved at nedbringe brugen af ikke-bæredygtigt produceret pap og spare på mængden af brugt materiale vil logistikken kunne optimeres, og man vil forventeligt se færre skader på de transporterede bøger.

### 5. **Energi: Overgang til grøn energi og fokus på øget energieffektivitet**

En stor del af CO<sub>2</sub>-udledningen skyldes i dag strukturelle forhold (energi- og vejnet m.m.), som bogbranchen kan have svært ved at påvirke. Dog er der allerede i dag mulighed for at gøre en forskel ved fx at indføre elbiler i leverancerne og anvende grøn energi til strømforsyning af lokaler. Det anbefales derfor, at DBK evaluerer alle led i produktionsprocessen med henblik på at afdække, hvor og hvordan energieffektiviteten kan forbedres.

### 6. **Transport: Bæredygtige alternativer til benzin- og dieseldrevet transport**

Transporten fra DBK til forhandlere og slutkunder er udgiverens ansvar. Det anbefales at identificere mere bæredygtige alternativer til den nuværende benzin- og dieseldrevne transport samt at identificere områder, hvor transport kan undgås/minimeres.

## 7. **Måling og rapportering: Udvikling af opgørelses- og rapporteringsmetoder for klima- og miljøpåvirkning**

Der mangler i dag et fælles sprog for, hvordan man i branchen skal opgøre og rapportere om klima- og miljøpåvirkningen. Det anbefales, at Danske Forlag, i samarbejde med Den Europæiske Forlæggerforening (FEP), arbejder for, at der udvikles branchespecifikke standarder for opgørelser og rapportering om klima- og miljøpåvirkning på virksomheds- og produktniveau.

## 8. **Støtte til nationale initiativer: Aktiv støtte til anbefalingerne fra klimapartnerskaberne for Handel, Landtransport og Affald, Vand og Cirkulær Økonomi**

Den grønne omstilling og opfyldelse af regeringens 70-procents-målsætning forudsætter politiske tiltag på nationalt og internationalt niveau. Gennem samarbejdet med Dansk Erhverv kan Danske Forlag støtte aktivt op om regeringens klimapartnerskaber og arbejde i Grønt Erhvervsforum. Det anbefales, at Danske Forlag her stiller sig til rådighed med branchenære virksomhedseksempler og eksempler på 'best practice' i den grønne omstilling.

## 9. **CSR i virksomhederne: Fokus på øget bæredygtighed i interne processer**

Det er vigtigt, at den danske forlagsbranche også ser indad i egen virksomhed, når det handler om den grønne omstilling. Derfor anbefales det, at Danske Forlag udvikler en CSR-kontrolliste, der kan fungere som en guide til de af foreningens medlemmer, som ønsker at forbedre deres egen interne klima- og miljøpåvirkning.

## 10. **Teknologi: Støtte til teknologisk fremme og udvikling**

Der findes stadig et stort uudnyttet potentiale i udvikling og anvendelse af nye teknologier til fremme af grøn omstilling. Det kan fx være tilfældet med mere CO<sub>2</sub>-venlige produktionsmaterialer, forbedrede muligheder for "print on demand" samt udvikling af datadrevne og mere intelligente marketingværktøjer, der giver bedre muligheder for at forudsige efterspørgslen og dermed begrænse overproduktion. Det anbefales, at branchen aktivt opsøger finansiering og forsknings- og udviklingssamarbejde (F&U-samarbejde) med private teknologivirksomheder og vidensinstitutioner (godkendte teknologiske serviceinstitutter (såkaldte GTS) og universiteter etc.) med henblik på at fremme brugen af nye teknologier i bogproduktionen. Desuden mangler der basal viden om klimabelastningerne forårsaget af e-bøgers produktion og brug, hvilket også kan være et fokusområde i et sådant samarbejde.

## Medlemsundersøgelsen og dens resultater

(Afsnit 2, side 13-20)

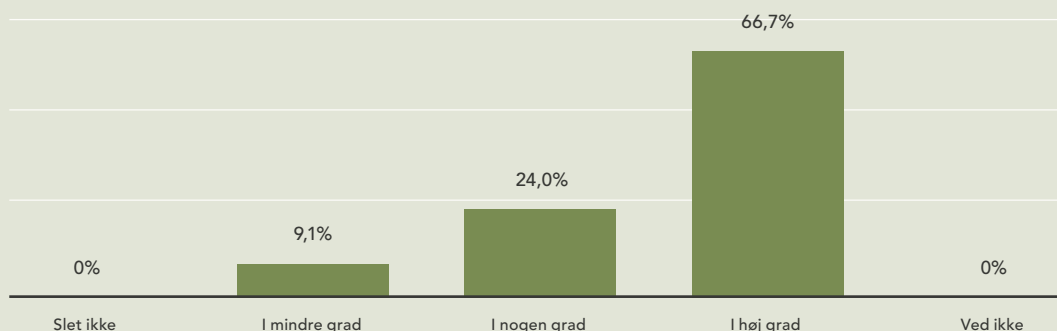
Rapporten tager afsæt i en spørgeskemaundersøgelse, som i foråret 2020 blev gennemført blandt medlemmer af Danske Forlag med det formål at kortlægge igangværende aktiviteter, mulige initiativer, barrierer, målsætninger og eksempler på 'best practice' inden for klimavenlig bogproduktion, se boks nedenfor. En hovedkonklusion i undersøgelsen er, at der i branchen er massiv interesse for og opbakning til at gennemføre initiativer, som sigter mod en mere miljø- og klimavenlig bogproduktion.

### Medlemsundersøgelse om grøn bogproduktion

Undersøgelsen har 32 respondenter, der sammen repræsenterer omkring 80 procent af den samlede brancheomsætning. 56 pct. af respondenterne repræsenterer små forlag (med en omsætning < 5 mio. kr./år), 28 pct. repræsenterer mellemstore forlag (omsætning 5-50 mio. kr./år) og 16 pct. er store udgivere (omsætning > 50 mio. kr./år).

91 pct. af respondenterne svarer, at de synes, at det er meget eller i nogen grad vigtigt, at forlagene arbejder med grøn bogproduktion. Herunder fremhæves særligt behovet for branchenær rådgivning og retningslinjer, der kan understøtte konkrete klima- og miljøinitiativer, samt et ønske om, at der udvikles fælles opgørelses- og rapporteringsmetoder for klima- og miljøpåvirkning i branchen.

#### Hvor vigtigt er det, at forlagene arbejder med grøn bogproduktion?



På trods af stor opbakning til en mere grøn bogproduktion afslører undersøgelsen også bekymringer forbundet med omstillingen, herunder en bekymring for, om rigide fælles mål og politisk regulering vil begrænse den daglige drift. Desuden fremgår det af undersøgelsen, at 58 pct. af respondenterne ikke anser grøn omstilling som en genvej til forretnings- og produktudvikling. Dette indikerer, at der ikke opleves en nævneværdig efterspørgsel efter klimavenlige bøger.

Blandt grønne initiativer, der allerede er implementeret mange steder i bogbranchen, kan nævnes genanvendelse og genbrug af usolgte bøger og papemballage, øget fokus på dansk produktion og nedbragt brændstofforbrug i forbindelse med bl.a. transport.

I tillæg hertil anvendes certificeringer i dag som en måde at signalere miljøbevidsthed overfor forbrugerne, fx ved at udgive bøger på FSC-certificeret eller EcoLabel papir. Ifølge undersøgelsen benytter 52 pct. af respondenterne certificeret papir i 90-100% af bogproduktionen, heraf 60 pct. af de store og 71 pct. af de mellemstore forlag. For de mindre forlags vedkommende er dette tal blot 38 pct., hvilket indikerer, at især mindre forlag oplever barrierer i brugen af FSC-certificeret papir.

Barrierer, der opleves blandt respondenterne, er manglende gennemsigtighed i branchen (hvilke muligheder eksisterer, og hvad er best practice?), manglende økonomiske incitamenter til grøn omstilling (fx ved at hjemtage produktionen til Danmark) og fravær af grønne alternativer (fx i form af CO<sub>2</sub>-neutralt papir og klimavenlig transport).

## Værdikæden og miljømæssige påvirkninger

(Afsnit 3, s. 21-54)

I rapporten defineres 'miljøpåvirkninger' som ændringer i miljøet, der helt eller delvist skyldes forlagsbranchens aktiviteter og produkter. I rapporten fokuseres der primært på negative miljøpåvirkninger forårsaget af fossile brændstoffer. Dette fokus skriver sig ind i en stor og stadig voksende klimadagsorden, nationalt og globalt. Denne dagsorden er relativt ny for de fleste brancher, herunder forlagsbranchen, og derfor er der især miljømæssige gevinster at hente ved at fokusere på tiltag, der fokuserer på at reducere negative klimapåvirkninger. Rapporten inkluderer imidlertid også overvejelser angående miljøforurening, affaldshåndtering og udtømmning af ressourcer, hvor der også stadig er plads til forbedringer i branchen.

I rapportens afsnit 3 kortlægges bogens livscyklus i hele værdikæden fra papirproduktion, design og bogtryk til distribution, salg og genanvendelse. Fokus er på kendte klima- og miljøpåvirkninger samt igangværende og mulige initiativer til en grønnere produktion.

### Designfasen (s. 25)

I designfasen vedrører den klima- og miljømæssige påvirkning de valg af design, som afgør f.eks. papirvalg og hermed selve papirproduktionen, valg af format, opsætning af bogen samt valg af udtryk og hermed materialevalg (laminering, farver, blæk, lim etc.). Igangværende initiativer er certificering med hhv. Svanemærket eller EU EcoLabel, som sikrer, at designet indeholder materialer, der stemmer overens med kriterierne for certificering.

### Skovbrug og papirproduktion (s. 27)

I papirproduktion er der to primære processer, som fører til klima- og miljøpåvirkninger: 1) Selve skovningen og 2) Den efterfølgende produktionsproces, hvor træ omdannes til papir.

Skovning har isoleret set en enorm indvirkning på både klimaet og biodiversiteten, og i den forbindelse er der allerede i dag en udbredt brug af FSC- og PEFC-certificeret papir, som understøtter bæredygtigt skovbrug. Herudover er det en pointe, at valg af papir kan være en af de vigtigste beslutninger, forlagene kan tage for at mindske klimabelastningerne, da papirkvaliteter kan variere meget i deres miljøpåvirkning afhængigt af produktionsprocessen (strømkilder, energieffektivitet, maskiner mv.).

### **Produktion af supplerende materialer** (s. 32)

I produktionen af såkaldte "supplerende materialer" (laminering, farver, blæk, lim etc.) vedrører den primære klima- og miljømæssige påvirkning de skadelige kemikalier, såsom blæk og klæbemidler, der anvendes i produktionen. Brugen af kemikalier reguleres allerede i dag via EU-direktiver m.v. Klima- og miljøvenlige materialer identificeres i dag ved Svanemærket eller EU EcoLabel. Disse mærker udvikles og tilpasses løbende ny viden og nye løsninger på området.

### **Tryk og indbinding** (s. 34)

Den primære klima- og miljømæssige påvirkning fra tryk og indbinding sker i selve trykningen og afhænger derfor af mængden og typerne af anvendt trykfarve, af trykkeriets energikilde og energieffektivitet samt af trykpressens kvalitet og levetid. Igangværende initiativer er implementering af en række støtteprogrammer udviklet af GRAKOM, som er interesseorganisation for produktions-, handels- og rådgivningsvirksomheder indenfor grafisk kommunikation, medier og markedsføring. GRAKOM har en række konsulenter, der rådgiver om grøn omstilling og CSR-koder.

### **Transport til lager** (s. 40)

I forbindelse med transporten fra trykkeriet til lageret (DBK) er den primære klima- og miljømæssige påvirkning CO<sub>2</sub>-udledning og luftforurening fra de lastbiler, der transporterer bøgerne. Et igangværende initiativ er fokus på at pakke leverancer til samme destinationer i større bundter, så antallet af gange, turen skal køres, kan mindskes.

### **Lager og sortering** (s. 42)

I lageropbevaringen og sorteringen af bøger stammer den primære klima- og miljømæssige påvirkning fra energikilden og strømforbruget i lagerbygningerne, som bl.a. understøtter temperaturkontrol og driver transportbåndene. Igangværende initiativer er løbende fokus på at skifte til grøn energi i lagerbygningerne og udskifte gamle maskiner med nye, mere energieffektive anlæg.

### **Emballage og klargøring til distribution** (s. 43)

I forbindelse med emballering og klargøring til distribution af bøger kan klima- og miljøpåvirkningen henføres til selve materialevalget samt til mængden af emballage, der anvendes. Den anvendte materialetype bestemmer energiforbruget i bogproduktionen, og dette kan være meget højt, hvis der ikke er tale om bæredygtigt papir, pap, plastik. Igangværende initiativer er Danske Forlags opbakning til arbejdet i Klimapartnerskabet for Handel, hvor der er fokus på at fremme udvikling og anvendelse af bæredygtig emballage og distribution.



**Distribution til detailhandlere / endelige forbrugere** (s. 45)

I distributionen til detailhandel og forbrugere er den primære klima- og miljømæssige påvirkning typen af transport, der benyttes, samt hastigheden, hvormed varerne skal leveres (kan de "bundles" eller skal de straksleveres?). Et igangværende initiativ er så vidt muligt at henlægge transporten til ydertimer (aften og nat), hvor der er minimal trafik, og hvor energiforbruget derfor kan mindskes.

**Genbrug af solgte bøger** (s. 47)

Ved genbrug af solgte bøger finder den primære klima- og miljømæssige påvirkning sted, når bøgerne bortskaffes hos forbrugerne som almindeligt affald og dermed bliver til brændsel. Et igangværende initiativ er pantsystem i Bog&Idé. Her kan man indlevere sine brugte bøger og få et gavekort som modydelse. Dette sikrer, at bøgerne bliver genbrugt på en klimavenlig måde. På et overordnet plan støtter Danske Forlag op om arbejdet i regi af Klimapartnerskabet for Affald, Vand og Cirkulær Økonomi. Her er ambitionen, at 90 pct. af al affald i Danmark bliver genbrugt inden år 2030.

**Returnering af bøger** (s. 48)

Ved returnering af ikke-solgte bøger henføres den primære klima- og miljømæssige påvirkning til selve transporten. Det nuværende faktureringsystem hos DBK forudsætter fysisk indlevering af bøger, der skal sættes ned i pris og sælges på udsalg. Herudover er der en klima- og miljømæssig påvirkning forbundet med brugen af emballage og risikoen for spild pga. ødelagte bøger. Det overvejes p.t., hvordan man kan indføre nye returprocedurer for udsalgsvarer.

**Makulering / genbrug af usolgte bøger** (s. 50)

I forbindelse med makulering og genbrug af ikke-solgte bøger kommer den primære klima- og miljømæssige påvirkning fra de bøger, som ikke sorteres og genanvendes på en hensigtsmæssig måde. I dag genanvendes 75-80 pct. af de ikke-solgte bøger. De resterende bøger sendes til forbrænding. Det overvejes p.t., hvordan man kan sikre bedre sortering og genanvendelse af ikke-solgte bøger.

**Markedsføring** (s. 51)

Hvad angår markedsføringskampagner kommer de klima- og miljømæssige påvirkninger fra processen bag bogproduktionen, og især valget af papir samt procedurer for genanvendelse er af afgørende betydning. Det overvejes p.t. at udvikle et system, som giver forhandlere mulighed for at bestille markedsføringsmateriale, som er specifikt tilpasset deres behov. Dette er en model, man har udviklet og implementeret i USA.

**CSR og interne forhold** (s. 53)

I forbindelse med forlagenes egne CSR-strategier og interne forhold kommer klima- og miljømæssige påvirkninger fra en række kilder: elforbrug, rejseaktiviteter, affaldshåndtering, valg af rengøringsartikler, vedligehold af bygningsmasse, kantinens tilbud, papirforbrug etc. Mange forlag er allerede godt i gang med deres egne CSR-strategier.

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# 1 Introduction

The 'green agenda' has truly taken centre stage as a political and social issue in Denmark. In 2020, the first 'climate law' was ratified. The law sets goals to reduce national greenhouse gas emissions by 70% before the year 2030 (compared to levels in 1990), and to be a completely carbon-neutral state by 2050. In the midst of these political ambitions, the private sector is key partner and is already making moves to account for their own environmental impacts, implementing active measures to lessen or offset these effects.

The publishing industry is no different, and there has recently been widespread international interest on the question of the environmental impacts of book production. Concerns regarding sustainable forest management have been central to environmental policy and non-governmental environment activism since the 1990s, and the first studies comparing the environmental impacts of physical books to digital books were published in 2012. According to research by the Kungliga Tekniska Högskolan (KTH), the environmental impact of the physical book is actually surprisingly small – so small, in fact, that the consumer's mode of transport to the bookstore can have a substantial influence on the overall environmental impact of the product.

Yet even with a comparatively small environmental impact in relation to other products, the globalised character of book production requires a considerable amount of travel, as raw materials and final products are transported across national boundaries. Furthermore, paper production and printing are both high energy consuming processes and forest preservation is crucial, to ensure biodiversity conservation and maintain their carbon-storing abilities. It therefore remains pertinent to examine the environmental impacts that continue to be present in the production of books and explore the possibilities available for minimising these.

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**Despite the comparatively small environmental impact, changes can be made to improve environmentalism in Danish publishing.**

There have not yet been centralised efforts to implement environmental initiatives in the Danish industry, although the industry has improved in its environmental performance throughout its history. This report initiates an examination of the opportunities available for centralised initiatives and pinpoint where the biggest, feasible changes can be made to lessen the environmental impacts of the industry, specifically within physical book production. For the purposes of this report, 'environmental impact' is defined as changes to environment wholly or partially resulting from the activities and products of the publishing industry. While there is a primary focus on fossil fuel emissions from production, this report also considers pollution, waste management, and resource depletion as sources of environmental impact.

The report provides an overview of the current sentiments and ambitions regarding green publishing present in the Danish publishing industry, alongside an examination of the lifecycle of the book as it progresses through the entire globalised value chain.

Through both a membership survey of Danske Forlag members and interviews with key industry figures, an abounding support for a green transition and the pursuit of common, industry-wide goals has become clear. Yet simultaneously we see concerns regarding barriers at the firm, industry and structural level, which limit the ability for Danish publishers to fully implement an environmental agenda. These industry attitudes and primary concerns are presented in Chapter 2, finding that a key barrier to implementing environmental production remains the lack of easily accessible, transparent information about how to do so.

In Chapter 3, a value chain analysis examines all actors and processes involved at every step of production and provides an assessment of the environmental impact attributed to each step. Subsequently, this chapter considers the current environmental initiatives present in the Danish industry, whilst exploring all of the possible efforts that could be pursued in order to minimise the environmental impact of each node in the value chain. The analysis finds that paper production and printing are the processes with the largest environmental impact, followed by international transport. The report identifies environmental initiatives that can be pursued at various levels with the involvement of a dispersion of actors, falling into categories of direct-action, certification, centralised industry support and structural initiatives. It then goes on to give due consideration of the barriers which may limit their viability.

Following the overview of total possible initiatives, Chapter 4 outlines concrete recommendations and priorities, based on those believed to be the most feasible within the capacity of the industry. In doing so, this report establishes the foundation for future collaborative work in the industry and seeks to provide clarity and transparency for its members in supporting their environmental transitions and ambitions.

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**Embracing a green transition in publishing is vital, not just for the environment, but for the performance of the industry.**

Embracing opportunities to further pursue a green transition in the world of publishing is vital, not just for the environment, but for the performance of the industry. Pursuing a green agenda will ensure that books will meet, and even pre-empt, sustainability demands from consumers that grow increasingly environmentally aware. This includes not only private consumers, but also increasing demands from public institutions, as political regulations and guidelines in this area grow stricter in the midst of national environmental goals.

Yet moreover, such considerations align with the ethos of the world of the book and of publishing. Just as the content of the materials published seek to generate knowledge and contribute to social well-being and development, the products themselves will be physical manifestations of that learning and social consciousness.



## 2 Membership survey and results

Earlier this year, Danske Forlag conducted a membership survey to gather industry opinions and experiences regarding environmentally conscious publishing and its challenges. The results of this survey have provided a foundation for the investigations of this report and the concluding recommendations, which strive to provide answers to some of the questions and concerns expressed by the members. This section outlines and discusses the results of this survey and details how they relate to the rest of the report.

In total, there were 32 responses out of the 71 members, distributed as follows:

	Total Members (71)	Responses	Pct. of total responses	Pct. of responses within category
<b>Large firms</b> (+50 mil. DKK)	5	5	16%	100%
<b>Medium firms</b> (5-50 mil. DKK)	17	9	28%	53%
<b>Small firms</b> (0-5 mil. DKK)	49	18	56%	37%

While this sample cannot give a fully representative overview of the beliefs in the industry, and may impact the significance of the results, it provides a general guide to industry sentiments. This said, when considering the market share held by the publishers, the respondents of the survey account for 80% of industry turnover, and therefore represent the views of the publishers with a majority of the market share. Furthermore, numerous repeated themes throughout responses indicate several points of consensus in the industry.

Centrally, the survey revealed a majority of support for green publishing and an increasing attention to this as an area of focus. Furthermore, the survey found overarching support for exploring and establishing common goals and industry-wide initiatives to pursue a green agenda, accompanied by many suggestions for how Danske Forlag can provide assistance to this end. The survey also unveiled initiatives already being pursued by members.

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**The survey revealed majority support for green publishing as an area of focus among members**

However, these expressions of support and current initiatives were accompanied by concerns regarding the barriers experienced in pursuing environmentally conscious production. A particular limitation, which was repeatedly mentioned, was a lack of transparency and information to support transitions toward more green production. In the following sections, this report will address the revealed barriers and provide some of the information directly desired by respondents.

## Perceptions of green publishing

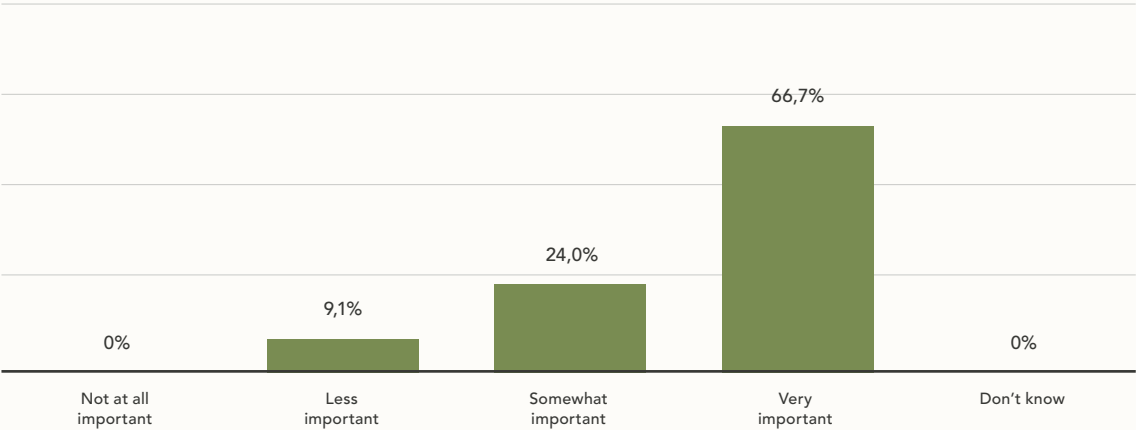
The support for and interest in green publishing made itself evident throughout the report, in both short form and long form answers. As visualised in the graph below, no members claimed working with green publishing to be of no importance, and only three considered it important to a small extent. Meanwhile, nearly 67% of respondents consider working with green publishing to be of high importance.

Nearly 67% of respondents consider green publishing to be of high importance

64% of respondents answered 'yes' to implementing shared industry goals

In extension of this, 64% of respondents answered 'yes' to implementing common industry goals and initiatives. Divided among the different size strata, of the large firms, 80% answered that they would support common goals, and 69% of the small firms did, as well. As indicated by some of the expanded answers, this desire for common goals is in part driven by the desire for centralised advice and information to limit costs and resources required

### How important is it that publishers work with green book production?



for implementing environmental initiatives. Of the concrete suggestions provided, many expressed desires for uniform and transparent measurement methods and standards, as well as common guidelines.

Among the medium sized firms, 43% answered yes, while 43% also answered no to implementing common industry goals. This result may be a consequence of worries that rigid common goals will restrict firm operations and therefore potentially cause damage to the firm. As an indication of such a sentiment, the consensus among all firm sizes was that there is not a desire for politically determined goals for reductions and initiatives, with 44% of respondents answering 'no' and 26% answering 'don't know'. However, the results for the medium firms may also be limited by the sample size for the survey, as only 7 medium-sized members responded.

The members do not view green publishing as an area that provides many new opportunities for business or product development. When asked whether the publishers felt the environmental agenda would provide new business opportunities, 26% responded 'none' and 32% responded 'to a small extent', with only 10% responding 'to a great extent' and 16% 'to some extent'. As to whether a focus on environmental initiatives had influenced product development, 35% responded 'not at all', 39% 'to a small extent', and 13% responded 'to some extent' and 'to a great extent' respectively. These results indicate that perhaps there is not yet a great demand for environmental publishing from consumers, entailing limited returns to environmental transitions and production methods for members of the industry. However, this also indicates an area that can warrant more exploration and collaboration in the industry. In providing better understanding of how environmental enterprises can provide business and product development opportunities, more benefits for the publishers can be uncovered, which may serve to counteract some of the barriers publishers experience in implementing environmental initiatives.

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**Members do not view green publishing as an area that provides many new opportunities for business or product development**

## Current initiatives in the industry

There are already several initiatives being carried out by members, but these vary a great deal across the industry. When asked if working to directly reduce the negative environmental impact of book production, overall 38% answered 'yes', while 38% answered 'no, but considering it', with 21% answering 'no, and not considering it'. This latter answer was only provided by small and medium sized publishers; 83% of answers in this category came from small publishers alone. Among large publishers, 80% answered 'yes', and 20% answered 'no, but considering it'. The wealth of answers falling within the 'no, but considering it' category provide support for this report and for the development of common initiatives in the industry; with more resources and information available, it may be easier to support those who wish to implement changes to lessen the environmental impact. Furthermore, it may inspire and support the capacity of those who otherwise would not consider implementing changes.

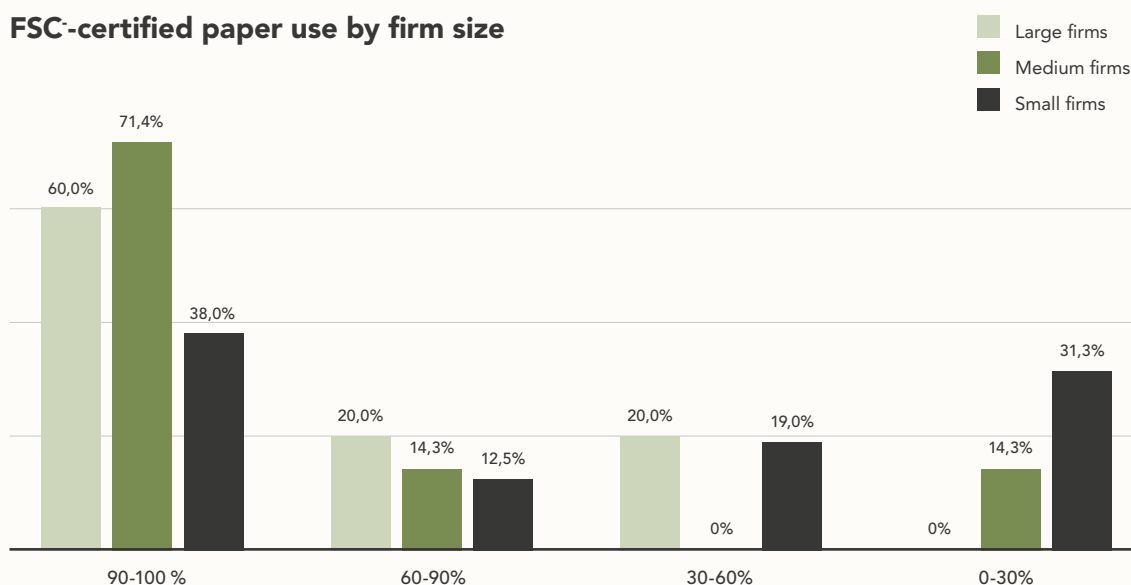
Current industry initiatives fall broadly within two categories: the use of **certifications** and **direct-action**. Certifications are used as a means for the publisher to regulate the behaviour of other actors in the value chain and to signal environmental consciousness, such as use of FSC-certified paper or the EU Ecolabel. Certifications can also offer a benchmark to compare products and production processes against each other, assuming they are trusted and sufficiently regulated by an impartial third party. Direct-action initiatives fall within the decision-making power of the publishers themselves and can include actions related to the work of the publisher that fall outside of direct production, such as the implementation of CSR (corporate social responsibility) governance to regulate internal operations of the company. A third potential category, which was not mentioned by any members, is **structural initiatives**, which require institutional and political support for broader changes that expand beyond the industry, including changes in infrastructure and technology, as well as the support of political incentives to facilitate transitions.

### Current initiatives fall within the categories of certifications and direct-action

One of the success stories of the industry is the use of FSC-certified paper (see **Chapter 3** for more information). Of all members, 52% use 90-100% FSC-certified paper in their production. Breaking this down, among large publishers this number rises to 60% and among medium publishers all the way up to 71%. Considering that volumes of production are much higher with the larger publishers, this encompasses a significant amount of the actual paper products being published for the Danish market. In fact, the large and medium publishers who use 90-100% FSC-certified paper account for approximately 2/3 of the total annual turnover of the participating publishers in the survey. In terms of market share, it is then 66% of turnover being produced by publishers using 90-100% FSC-certified paper.

With the small publishers, only 38% used between 90-100% FSC-certified paper. This indicates that smaller publishers experience some barriers to utilising certified paper.

#### FSC-certified paper use by firm size





In addition to FSC-certification, there are also other environmental certifications in use, although there is not as holistic an overview of this trend. Of the respondents, one is 'Cradle to Cradle' certified and one is ISO-14001 certified. 11 respondents reported having some products certified by the Nordic Swan Label, but the percentage of certified production varies from publisher to publisher – for some only 5-10% of products are Swan labelled and for others it is as high as 80-90%. Some respondents also referenced implementing the ClimateCalc certification for measuring the carbon footprint of individual printed materials (more information on these certifications can be found in **Chapter 3**).

The initiatives mentioned which constitute direct-action included reducing transport, recycling surplus stock, re-using cardboard packaging, and switching to production in Denmark. Other company-level initiatives were mentioned, such as switching to an organic-based canteen menu for employees, reducing energy consumption, and switching to renewable energy sources for their buildings.

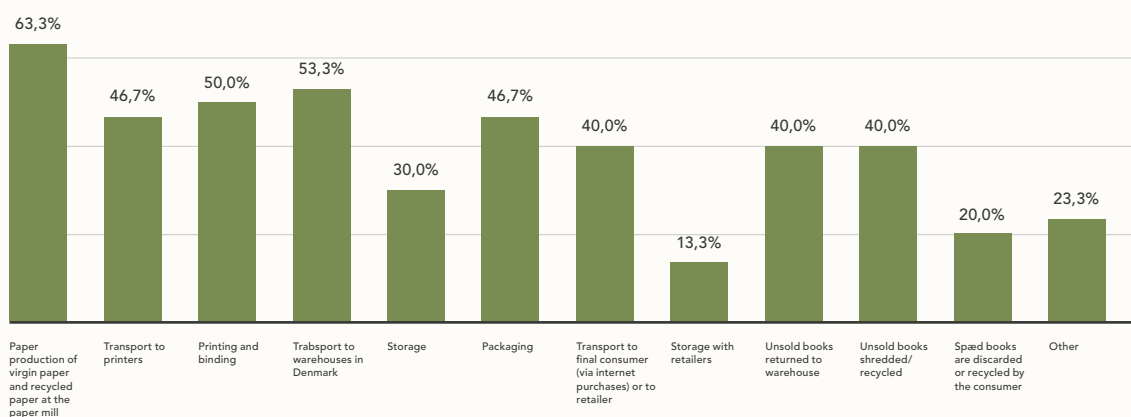
**Only 29% of members reported having established internal goals for 'grøn omstilling'**

Despite these enterprises to implement environmentally conscious practices, when asked if members had established internal goals for 'grøn omstilling' (green transition), only 29% of respondents stated 'yes'. This percentage was predominantly carried by the larger firms, of which 60% have established internal goals. For the medium and small publishers, the amounts were 26% and 19% respectively. This indicates that systematic direct-action programmes, which can be evaluated, have not been implemented to the same degree as certifications as a tool for environmental publishing thus far.

## Industry Awareness

Alongside current initiatives, there is also an awareness of areas that need attention which spans throughout the value chain. 60% of members responded that they experience other members of the value chain exhibiting expectations regarding the publisher's environmental

**Which areas of the value chain do you believe could be made more environmentally friendly?**

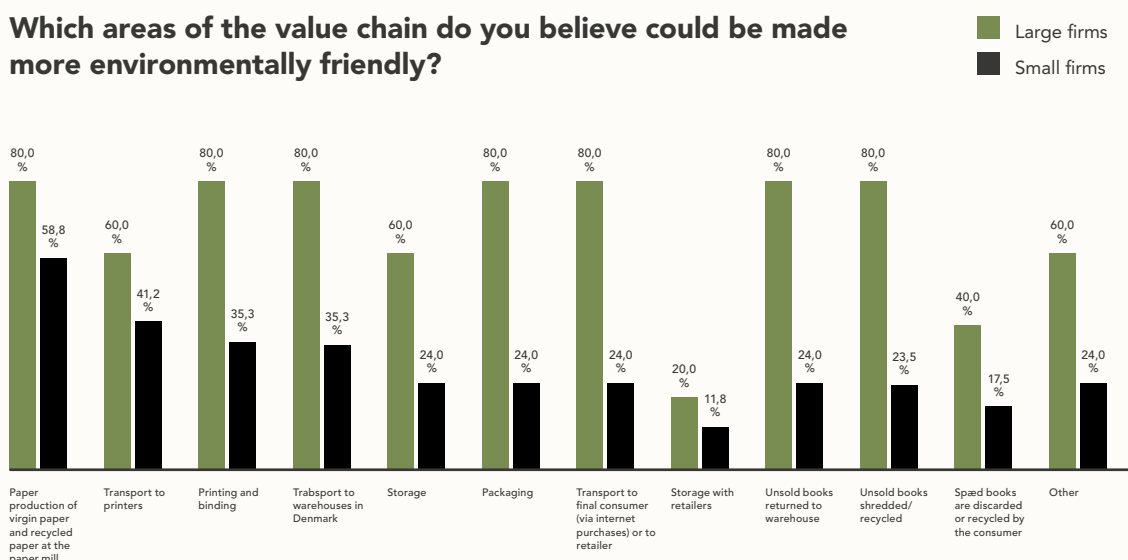


contributions. This includes final consumers (both private and institutional), authors, retailers, and printers. This also indicates a general awareness within the broader value chain about the desire to put environmental considerations on the agenda at various points of production.

The members indicated which areas of the value chain they believe can be made more environmentally friendly. According to the survey, the publishers see paper production, printing, and transport as the most important areas of the value chain that can be made more environmentally friendly. As is evident in **Chapter 3** of this report, these areas are those with the largest environmental impact in the production of books and are therefore important areas of focus.

However, in comparing responses from the large firms with those of the small firms, it becomes evident that the large firms believe there are far more areas where processes can be improved, than the smaller firms do:

### Which areas of the value chain do you believe could be made more environmentally friendly?



These differences indicate that this is an area the larger publishers have had more experience with, but also more resources to work with and impact. Alternatively, it may indicate that smaller publishers are already working with suppliers and collaborators throughout the value chain who display environmental efforts in many of these areas.

In considering potential developments, the respondents named several initiatives that could contribute to reducing the negative environmental impact of publishing. These included:

- Choice of printers: prioritising printers with environmental certifications or with transparent rules for production, and printers that are close to or within Denmark
- Choice of paper: recycled paper or FSC-certified
- Recycling books: some suggested donating unsold copies to schools or libraries
- Ensuring the quality of certifications, to make sure they meet the standards they claim to enforce
- Implementing ClimateCalc (see more in **Chapter 3**)
- Pursuing industry-wide, national collaboration to standardise and measure environmental impacts

These suggestions include both certification and direct-action options and are considered in **Chapter 3** within the overall evaluation of the value chain.

Several respondents also argued that moving over to more digital production in the form of e-books or audio books would enable them to reduce their environmental impacts, although there was also recognition from several members that they did not know whether digital production was better for the environment than physical production, or how.

Only one respondent argued that green publishing should not be the responsibility of the individual publisher, but that these decisions should be made by politicians and other actors. According to this opinion, publishers should only follow the rules set by central government institutions. This point opens up a debate about how proactive the industry should be, and whether publishers want to take a position as ‘first movers’ or ‘fast followers’ in environmental initiatives. As first movers, firms take initial steps to explore opportunities and break the ice, which can give them a competitive market advantage, as they are the first to deliver certain goods or services. As consumers become more and more environmentally conscious and set higher demands for the goods they purchase, it will be valuable to meet these demands and even pre-empt them. However, making first moves requires taking certain risks and up-front costs from investing in new production methods as the firm explores new frontiers. In some instances, it may be better to await direction and regulation from political institutions and quickly implement new procedures to comply. These considerations are important to include in determining the recommendations of this report, reflecting on the level of costs entailed by different moves in relation to their benefits, and where it can be advantageous to be a first mover versus a fast follower. This is also relevant for considering what lies within the capacity of the industry to do on its own, and what will require political and structural support.

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**Only 29% of members reported having established internal**

## Barriers and how to overcome them

Although there is much awareness and several initiatives already in place in the industry, there are of course also barriers experienced in attempting to implement best environmental practice. According to the membership survey, 50% of members answered that yes, they do experience barriers in implementing environmental initiatives and 36% responded that they don't know. Breaking this down across the different firm sizes shows another skewed distribution: of the large firms, 100% responded yes to experiencing barriers and 57% of the medium sized firms did, however only 31% of the small firms responded yes, with 56% responding ‘I don't know’. This once again reveals the lack of consistent, easily accessible information on this area.

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**Only 29% of members reported having established internal goals for ‘grøn omstilling’**

Akin to this, the survey revealed that one of the central barriers experienced is in fact a lack of transparency within the industry. To this, 52% of members over-all responded yes, with another top-heavy distribution: 80% of large firms and 71%

of medium firms responded yes to a lack of transparency, along with 38% of small firms. In explaining this lack of transparency, members elaborated that there is a need for a common understanding of which collective goals the industry is working toward, standardisation for calculations and reporting of the environmental impact, and clarifications of conflicting information. There simply seems to be a lack of overview over where the most important changes can be made and how.

Beyond a lack of transparency, other barriers were experienced at the firm, industry and structural level. These included financial barriers, lack of political support, and lack of alternative choices. Financially, it is more expensive to have books printed in Denmark than abroad. With books already relatively expensive due to the small language area, it is not desirable to raise prices to accommodate more expensive production. Regarding political support, many feel that there are not relevant political and tax incentives in place to support environmental transitions, or to set guidelines for how it should be done. And ultimately, a lack of available alternatives in the industry presents barriers for the publishers to make desired changes: there is no CO2 neutral paper, there is no paper production within Denmark, and electric vehicles are not widespread or energy efficient enough to meet the needs of the industry. These are structural barriers that require changes on a larger scale.

One respondent summarised many of these concerns, explaining:

**”Mange reduktionstiltag vil have fordyrende effekt på produktion og distribution, som næppe kan belastes prisen for kunderne. Administrative byrder ved opgørelse og måling af miljøbelastning, samt til dokumentation heraf. Varierende regulatorisk indstilling i forskellige lande. Mangel på afgiftsmæssige, skattemæssige eller politiske incitament, der tilgodeser miljøvenlig drift.”**

In developing guidelines and industry-wide initiatives for addressing the environmental impacts of Danish publishing, these barriers and the experiences of the publishers must be taken into consideration. Suggestions from the members themselves in the best ways to do so include: supporting the development of larger capacity for modern production within Denmark and Scandinavia, provide support for developing and distributing biodegradable packaging solutions, lobbying for political initiatives at both the national and EU-level to create incentives and support transitions, and importantly, ensuring inclusive, industry-wide dialogue and initiatives and the provision of more information from Danske Forlag.

This report seeks not only to provide some of the information and transparency that has hitherto been missing, but also to take first steps towards initiating dialogue and implementing centralised industry goals for environmental publishing.



# 3 The value chain and its environmental impact

This section outlines and describes each node in the value chain of the Danish publishing industry, accounting for the environmental impacts attributed to every stage in the lifecycle of the book. In addition to the nodes included in physical production, this analysis examines the parallel practices of marketing and internal operations of the publishers. After outlining the actors and processes, current initiatives in the industry are presented and possible new initiatives that could be implemented are considered. In this report, '*environmental impact*' is defined as the changes to environment wholly or partially resulting from the activities and products of the publishing industry. While there is a primary focus on the environmental impact of fossil fuel emissions from production, this report also considers pollution, waste management, and resource depletion as sources of environmental impact.

## Authorship and digital books not included in the report

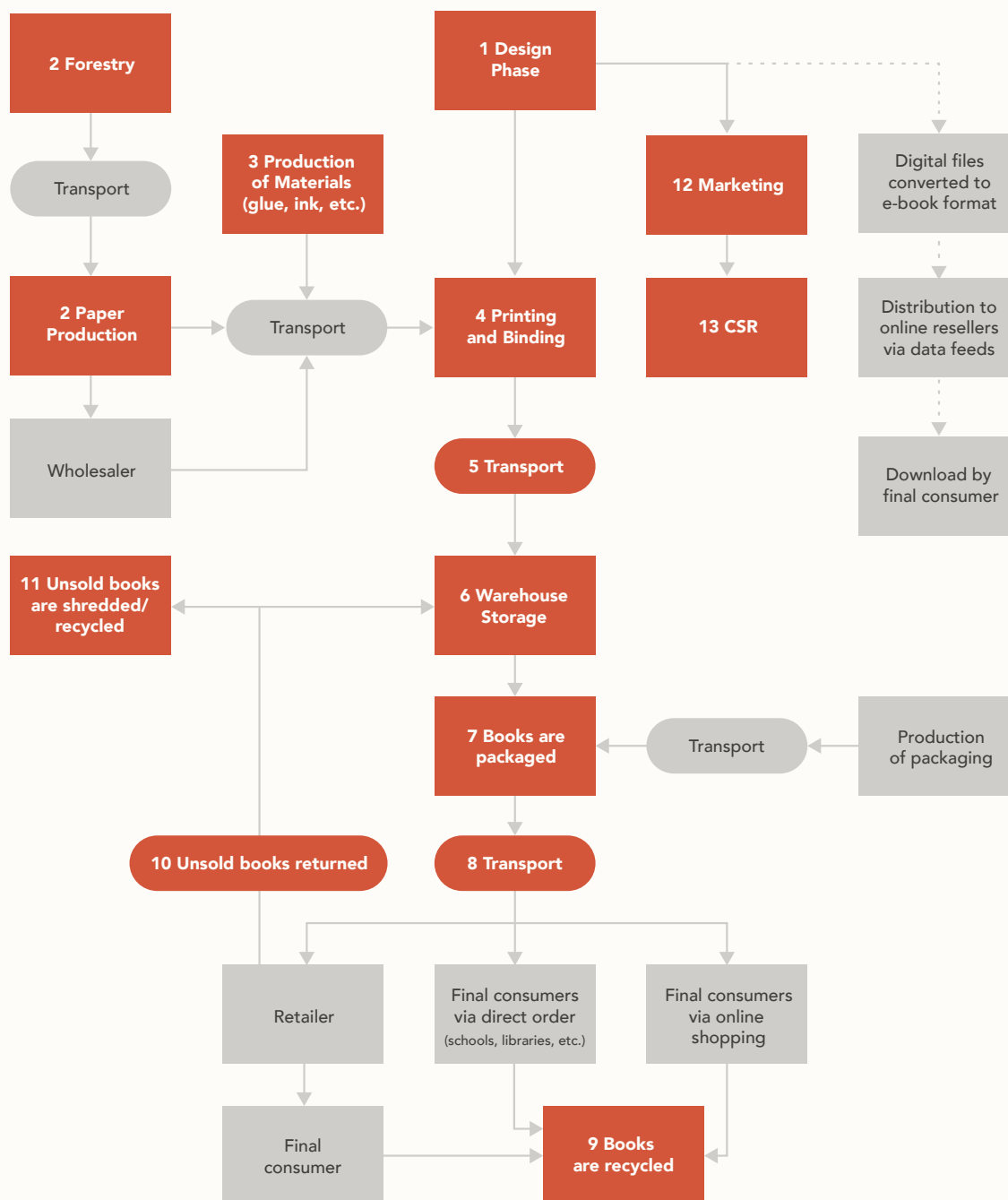
Our value chain analysis excludes the authorship node and the nodes constituting the production of digital books. Both are excluded as we focus on physical production. Yet it must be recognised that digital production is an important part of the industry which will continue to grow. As digital and energy infrastructure continue to develop environmentally, the digital production process of books and e-readers will simultaneously grow more environmentally friendly. However, it is important to note that there are environmental impacts of digital publishing that must be considered: namely those attributed to the production of e-readers and the energy consumption of data centres, streaming, and downloading. To this end, there are conflicting evaluations of how the environmental impact of digital books compare to that of physical books, depending on whether you consider the carbon footprint or other environmental impacts, such as pollution and resource depletion. Furthermore, calculating the environmental impact of digital books requires a great deal of information about the consumer, which we do not have, i.e. which types of e-readers they use, their energy supply and consumption, and from which sites they download their books. Simultaneously, the available technology concerning energy supply in Denmark is changing so quickly, with significant ramifications for the environmental impact of digital books. Sufficiently exploring this area therefore lies outside the reach of this report.

As illustrated on the following page, the production of books involves a series of processes that span across countries, as well as actors. In outsourcing many steps in production to suppliers, Danish publishers relinquish full decision-making power and full control over the environmental impacts of the production process. However, as the lead firms<sup>1</sup> of the value chain, publishers can shape the values and standards applied throughout the chain and have considerable power to influence the decisions of other actors.

<sup>1</sup> Lead firms are those who hold responsibility for the final product, organising and determining the division of labour throughout the value chain. Lead firms have the power to include or exclude other actors from the chain through subcontracting suppliers.

# The Publishing Value Chain

	Physical Book	Digital book
1. Access	Physical book is available only in the library	Digital book is available anywhere, anytime
2. Portability	Physical book is not portable	Digital book is portable
3. Searchability	Physical book is not searchable	Digital book is searchable
4. Interactivity	Physical book is not interactive	Digital book is interactive
5. Cost	Physical book is expensive	Digital book is cheap
6. Updates	Physical book is not updatable	Digital book is updatable
7. Security	Physical book is not secure	Digital book is secure
8. Accessibility	Physical book is not accessible	Digital book is accessible
9. Sustainability	Physical book is not sustainable	Digital book is sustainable
10. Flexibility	Physical book is not flexible	Digital book is flexible
11. Scalability	Physical book is not scalable	Digital book is scalable
12. Integration	Physical book is not integrable	Digital book is integrable
13. Customization	Physical book is not customizable	Digital book is customizable
14. Collaboration	Physical book is not collaborative	Digital book is collaborative
15. Analytics	Physical book is not analyzable	Digital book is analyzable
16. Personalization	Physical book is not personalized	Digital book is personalized
17. Social Media	Physical book is not shareable	Digital book is shareable
18. Cloud Storage	Physical book is not cloud-storable	Digital book is cloud-storable
19. Backup	Physical book is not backupable	Digital book is backupable
20. Disaster Recovery	Physical book is not recoverable	Digital book is recoverable
21. Compliance	Physical book is not compliant	Digital book is compliant
22. Auditability	Physical book is not auditable	Digital book is auditable
23. Transparency	Physical book is not transparent	Digital book is transparent
24. Accountability	Physical book is not accountable	Digital book is accountable
25. Reliability	Physical book is not reliable	Digital book is reliable
26. Availability	Physical book is not available	Digital book is available
27. Performance	Physical book is not performant	Digital book is performant
28. Scalability	Physical book is not scalable	Digital book is scalable
29. Flexibility	Physical book is not flexible	Digital book is flexible
30. Integration	Physical book is not integrable	Digital book is integrable
31. Customization	Physical book is not customizable	Digital book is customizable
32. Collaboration	Physical book is not collaborative	Digital book is collaborative
33. Analytics	Physical book is not analyzable	Digital book is analyzable
34. Personalization	Physical book is not personalized	Digital book is personalized
35. Social Media	Physical book is not shareable	Digital book is shareable
36. Cloud Storage	Physical book is not cloud-storable	Digital book is cloud-storable
37. Backup	Physical book is not backupable	Digital book is backupable
38. Disaster Recovery	Physical book is not recoverable	Digital book is recoverable
39. Compliance	Physical book is not compliant	Digital book is compliant
40. Auditability	Physical book is not auditable	Digital book is auditable
41. Transparency	Physical book is not transparent	Digital book is transparent
42. Accountability	Physical book is not accountable	Digital book is accountable
43. Reliability	Physical book is not reliable	Digital book is reliable
44. Availability	Physical book is not available	Digital book is available
45. Performance	Physical book is not performant	Digital book is performant



## The Nodes of the Value Chain

1. The Design Phase
2. Forestry and Paper Production
3. Production of Further Materials
4. Printing and Binding
5. Transport to Warehouse
6. Storage and Sorting
7. Packaging and Preparation for Distribution
8. Distribution to Retailers/Final Consumers
9. Recycling of Purchased Books
10. Return of Books
11. Shredding/Recycling Unsold Books
12. Marketing
13. CSR and Internal Operations

This dispersion of production makes a value chain evaluation especially pertinent for the publishing industry. In a study conducted by Carnegie Mellon University, Tier-1 and Tier-2 emissions – meaning emissions that result as a consequence of the publishers' direct functions (Tier 1) and their energy consumption to execute these functions

(Tier 2) - account for only 6% of total emissions generated by the publishing industry in the United States. To account for the majority of emissions from book production, it is therefore necessary to include Tier 3 emissions, meaning those which are a consequence of processes carried out by suppliers throughout the chain of production.

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## Emissions in the industry mainly stem from suppliers

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## Paper production and printing have the largest environmental impact

In the following analysis, it is apparent that paper production and the printing process have the largest environmental impacts. A 2006 life-cycle analysis study, published by the Danish Ministry of the Environment, provides a thorough breakdown of the environmental impact from various phases necessary to the printing process. Their study weights the environmental impacts of the different stages as follows: Paper production (31%), Printing (41%,

thereof 17% points from ink production), Cleaning (17%), Energy at print (6%), Plate making (2%, assuming the aluminium plates are fully recycled), Page production (2%), Finishing (>1%) (see more in section 4. **Printing and binding**). This analysis focuses on the nodes of paper production and printing, with particular attention to changes that can be implemented in these processes to reduce the environmental impact of publishing.

Regarding considerations of current and potential initiatives in the industry, the report covers initiatives which range from certifications, direct-action, and structural initiatives, as well as those facilitated by 'centralised industry support'. These include initiatives that can be facilitated by Danske Forlag to assist members and lead the industry. This illuminates the variety of tools available and the actions required by different actors at varying levels to realise them. The report also considers the potential barriers to successfully executing the proposed initiatives.

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## Initiatives include direct-action, certifications, structural or centralised industry support

# The Nodes of the Value Chain

1. The Design Phase
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13. CSR and Internal Operations



# 1. The Design Phase

## Important Actors

- The author (*Forfatteren*)
- The publisher's design team (*Forlagets designteam*)

In collaboration between the author and the publisher's design team, the layout and look of the book is designed. Decisions are made about which materials to employ in production, including the colour scheme for the ink and any beautification elements for the cover. This node remains in-house, and the publisher retains a high level of control over the process and its outcome.

## Environmental Impact

There is an environmental impact from energy consumption used to power computers running graphic design programs and from potential transport to and from meetings. Both actions lead to some level of greenhouse gas emissions, yet in the overall production of the book, these direct impacts are minimal.

However, decisions made in the design phase have vital ramifications for determining the environmental effects of the rest of the book's production, particularly in defining how many paper resources are required (in choice of page layout), whether any plastic must be produced (in instances of laminating the cover or packaging individual copies in plastic wrap), the types of treatment applied to the binding, and the choice of other beautification materials.

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**Design decisions have implications for total environmental impact of production**

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## Potential environmental impacts from paper waste and plastic production

According to an interview with Fie Lauridsen from Nørhaven, some layout choices can lead to waste of up to a third of paper, due to how the paper must be cut, and the 2006 lifecycle study finds paper waste to have a significant environmental impact. According to Part II of the report, the study finds that reducing paper waste from 32.1% to 3.3% could reduce the total weighted aggregate environmental impact of the production process by 11%.

Regarding the lamination of books, plastic production has considerable negative environmental impacts as an oil-based product, resulting in pollution of microplastics and other additives, which are harmful to human and wildlife health. Furthermore, plastic use means the book cannot be recycled through usual procedures to re-use the pulp.

## Current Initiatives in the Industry

There are currently not many initiatives dealing specifically with the design phase. In the event publishers decide to have a product certified, i.e. with the Swan Label or EU Ecolabel (see section 4. **Printing and Binding** for further details), the product is designed to include materials, which comply with the certification criteria, and the design incorporates the label

of the certificate. Tomas Henriksen (JP/Politikens Hus Forlag) explained that there are some considerations regarding standardisation of layouts and paper qualities to avoid paper waste, but these have not been systematically implemented.

It is important to note that many materials used in production are subject to regulation by the EU (see more in section **3. Production of Further Materials**), since most printing for the industry is carried out in the EU. These regulations, which include controls for solvents and paper production, work to limit the environmental impacts of printing in minimising the chemicals used in their production.

## Possible Initiatives to Improve Environmental Impact

### 1. Standardisation of layouts:

One suggestion from interviews included the implementation of standardised paper sizes and page layouts, which are optimised for the printer's machinery to minimise paper waste.

**Barriers:** This would limit the artistic expression available to the publisher and may not be implementable in instances where the author has express wishes for the visual of the book.

### 2. Ceasing plastic lamination in binding treatment:

Another suggestion was that the industry avoid lamination of certain editions, minimising the use of plastic in treatment. However, plastic treatment provides protection for the book as it is handled throughout the value chain. Without it, books will be more susceptible to damage, particularly when retailers apply price stickers. There are eco-friendly lamination alternatives, often cellulose-based, and other environmental finishing and varnish options beginning to become available (see for example the British print finishers [Celloglas](#)). These are bio-degradable and allow paper to be recycled through the normal re-pulping system. The book *'Encyclopaedia of Experimental Print Finishing'* provides a full overview of all the options available and information regarding the environmental impacts of various choices.

**Barriers:** Eco-friendly finishings are not offered by all printers, limiting publishers' choice of printers if they wish to produce plastic-free. As a product in development, there is also a concern that the quality of plastic-free lamination available will not live up to requirements.

### 3. Design guide:

A more comprehensive solution would be to establish a guide for 'eco-design', including a check list of considerations for design to be implemented in every design process. Such a guide would help to manage the entirety of the books' production process. The French Publisher's Association (SNE) made a similar suggestion to their members in 2017, which could provide inspiration. The extent to which this guide by the SNE has been put in use by French publishers is unknown.

**Barriers:** In terms of implementation, there are barriers concerning the extent to which the design guide can be uniform from publisher to publisher. The optimal format for a book will differ between printers, and so the guide cannot prescribe industry-wide standard formats or layouts. To combat this, a general guide can be developed, which each publisher can amend to suit their particular production procedures and suppliers. In order to be truly helpful, more research is required to inform which beautification materials should be left out of production due to their harmful environmental effects. With such information, this can then be included in a comprehensive design guide.

## 2. Forestry and Paper Production

### Important Actors

- The foresters (*Skovbrugere*)
- The paper mills (*Papirmøllen*)
- Wholesalers (*Grossisten*)
- The printers (*Trykkeriet*)
- The publisher (*Forlaget*)

In paper production, there are several actors with vital, interacting roles. Foresters are responsible for the management of the forests and logging. The wood is then transported to the pulp and paper mill, where the paper is produced. The paper is then either sold to a wholesaler, who further manufactures it, or it is sold directly to the printers.

According to interviews, the publisher has a great deal of decision-making power in choosing paper for production. It is, however, ultimately the printers that have the purchasing agreement with the supplier. There are therefore occasional limits to which paper the publishers can choose, and choices are often informed by the paper qualities included on the printers' price lists. In the event a publisher's desired paper cannot be provided, the printer is asked to find the closest possible alternative.

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**Publishers have the decision-making power regarding paper for production**

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**Much paper for the industry is sourced from Scandinavia**

Interviews also revealed that much of the paper used in production of books for the Danish industry is sourced from Scandinavia (particularly from Sweden and Finland), and if not, from the EU. However, there are some instances where the publishers do not know exactly where the paper is sourced.

### Environmental Impact

Forestry has an incredibly important impact on the environment. Estimates show that forests store more carbon than the atmosphere and the world's oil reserves combined, and according to the UN REDD+ programme (United Nations Reduced Emissions from Deforestation and Degradation), deforestation and degradation accounts for ca. 17% of carbon emissions globally. When trees are cut, the carbon oxidises into CO<sub>2</sub> and is released into the atmosphere, and their carbon storing abilities are lost. Furthermore, forests are vital in the preservation of biodiversity, and many forests provide a source of livelihood for forest dependent people. Sustainable forest management and responsible paper sourcing is therefore fundamental to protecting the environment, and the source of paper has a considerable impact on the environmental impact of a book's production.

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**Important environmental impacts from both forestry and paper manufacturing**

Additionally, the environmental impact of paper production is determined by its energy source and consumption and the transport necessitated for **manufacturing**. The Danish study from 2006 finds that paper production (cradle to gate) is one of the most significant contributors to potential environmental impact in the life cycle of printed matter, the main cause being related to its high rates of energy consumption. Supporting this, a South African study from 2016 finds that 41% of total energy consumption in the production of books happens at the stage of paper production. The French Publisher's Association (2017) found that paper is the largest contributor to a publisher's carbon footprint, accounting for between 50-80%.

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**Publishers have the decision-making power regarding paper for production**

It is important here to emphasise that forestry and paper manufacturing have separate environmental impacts. With forestry, we consider the environmental impacts that are caused by the (mis)management of forests and logging to procure the timber for paper production, whereas in paper manufacturing, we consider the environmental impacts caused by transforming timber into paper products.

Finally, there are also considerations to be made regarding the amount of transport needed to distribute the finished paper product to the printers. When paper is sold via wholesalers, there are extra legs of transport which must be accounted for in examining the environmental impacts.

### Current Initiatives in the Industry

As most paper used in Danish production is sourced from the EU, the timber utilised is subject to regulation by the EU Timber Regulation, which entered into application in 2013.

## Facts

### Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010 (The EU Timber Regulation)

This EU regulation prohibits illegally harvested timber from being placed on the EU market and sets out preconditions for the marketing of timber and timber products in the EU. The key points of the legislation read:

- The regulation requires 'operators' who place timber products on the EU market for the first time to exercise 'due diligence' to ensure they supply products made of legally harvested timber. To this end, operators must use a due diligence system.
- Operators may set up their own due diligence systems or use one created by a monitoring organisation.
- Monitoring organisations are recognised as such by the European Commission. Their role is to assist operators comply with the requirements of the regulation.
- To facilitate the traceability of timber products, all traders who buy and sell timber on the market must keep records of their suppliers and customers.
- The regulation considers timber/timber products to be legally harvested if they have a Forest Law Enforcement, Governance and Trade (FLEGT) licence (established with Regulation (EC) No 2173/2005), or a CITES permit (Regulation (EC) No 338/97).

Source: <https://eur-lex.europa.eu/legal-content/EN/LSU/?uri=CELEX:32010R0995>



This regulation outlines obligations to combat illegal logging and facilitates the traceability of timber products.

Beyond legal regulation, the FSC and PEFC certifications have been established to further regulate forestry practices, thereby encouraging and facilitating sustainable forestry and limiting the environmental impacts attributed to this process. When managed sustainably, forestry for paper production can contribute positively to the environment, according to reports by the International Renewable Energy Agency and Skogforsk.

## FSC and PEFC certificates certify sustainable forestry

### Sustainable forestry can improve carbon storing abilities of forests

According to these studies, trees that are still growing consume and store more CO<sub>2</sub> from the atmosphere. The closer a forest comes to being fully matured, the less CO<sub>2</sub> it absorbs, and as old trees begin to rot, they emit their stored CO<sub>2</sub>. With active, sustainable forestry, however, new trees are constantly planted, and the rate of CO<sub>2</sub> that can be absorbed by the forest

continues to be maximised as forest cover is maintained. With FSC and PEFC regulations in place, most forestry in Europe assists in the absorption of carbon emissions, and some therefore argue that forestry practices, which live up to the strict standards of certifications, are in fact carbon neutral.

## Facts

### FSC and PEFC Certifications

**Forest Stewardship Council (FSC):** The FSC, founded in 1994, is an international non-profit organisation dedicated to promoting responsible forestry, ensuring foresters meet the highest environmental and social standards. They work to ensure that the forest's biodiversity, productivity and ecological processes are maintained, and that forestry practices are socially sustainable for local people. Their efforts are supported by the WWF and Greenpeace. To be FSC-certified, forests are inspected and certified against strict standards based on FSC's 10 Principles of Forest Stewardship. Inspections are undertaken by independent third parties, such as the Soil Association, that are accredited by the FSC. For a product to be FSC certified, both supplier and producer must be able to trace the source of materials through the entire value chain. You can check the certification of a company or a product by searching the FSC Certificate Code (found on invoices from FSC certified companies) or the FSC License code (found on the FSC label on individual products). Today there have been awarded over 1,600 Forest Management certificates (awarded to forests) and 38,000 Chain of Custody Certificates (awarded to companies that supply FSC-certified products).

**Program for Endorsement of Forest Certification (PEFC):** Established in 2000, PEFC is also an internationally recognised non-profit, non-governmental organisation dedicated to promoting Sustainable Forest Management (SFM) through independent third-party certification. PEFC emphasises a 'bottom-up' approach, whereby national certification systems are developed independently and come together under the umbrella of PEFC. Over 51 national schemes are endorsed by PEFC. To date, more than 20,000 companies have obtained PEFC Chain of Custody certification, offering tens of thousands of PEFC-certified products globally. PEFC sets robust standards and realistic criteria for sustainable forest management at a global level, that are continuously updated to incorporate new knowledge, best practices and changing expectations. For a product to be PEFC certified, both supplier and producer must be able to trace the source of materials through the entire value chain. To check PEFC certified products and companies, you can search the PEFC Certificate Codes and PEFC license codes.

Sources: [fsc.dk](https://www.fsc.org/), [pefc.dk](https://www.pefc.org/), [Norsk Forleggerforening](https://www.norskforleggerforening.no/) (2019), [GRAKOM](https://www.grakom.no/) (2018)

A considerable number of printed products in Denmark are printed on FSC-certified paper – particularly among the biggest publishers. According to interviews, many large publishers use up to approx. 90% FSC-certified paper in production. This is not 100% because some special-ised paper types are not available as FSC-certified, and occasionally the publishers are not aware of where the paper originates from.

Furthermore, the Norwegian Forleggerforening have produced a comprehensive report regarding responsible paper sourcing and have developed a guide for Norwegian publishers in their choice of paper. This guide results in a scoring system for the environmental performance of different types of paper, with the highest score awarded for certified material from a known and stated source country, with low risks for illegal activities in the forest sector and for forest conversion.

## Facts

### The Norwegian Report on 'Responsible Sourcing of Printed Material'

The report was completed in 2019 and provides a comprehensive guide to sourcing sustainable paper for printed materials. The report provides definitions for responsible and controversial paper, and recommends paper sourcing policies and tools that members should adopt to prevent use of controversial paper.

The report defines controversial paper as paper made from wood harvested: (1) in violation of national and international laws in country of harvest, (2) in violation of traditions and human rights, (3) from forests with high conservation values, (4) in natural tropical forests, (5) in forests being converted to plantations and non-forest use, and (6) from forests with genetically modified trees.

The report encourages members to develop and publicly communicate a policy for their sourcing of paper. They believe this policy should include: a clear commitment to exclude controversial paper from their products, concrete goals and timelines for implementing sourcing practices, and specification of tools and measures to control for exclusion of controversial paper. Their concrete recommendations include using recycled paper, FSC or PEFC certified paper, paper scored by PREPS, and implementing a system of due diligence in instances of using non-certified paper. These recommendations result in their scoring system, which reads as follows:

- Score 1:** Certified material. FSC (100% recycled or mix) or PEFC-certified. The supplier states country of origin and the wood species used in production. Country of origin has low risks for illegal activities in the forest sector. Low risk of high conservation values.
- Score 2:** Certified material. FSC or PEFC-certified. The supplier states country of origin and wood species used in production. The wood species does not grow in natural tropical forests. If the material is from a tropical region, it is only from plantations.
- Score 3:** Not certified material. Paper used for the book is approved by PREPS. The supplier states country of origin and wood species. The publisher has a due diligence system, and the country of origin has low risk for illegal activities in forest sector.
- Score 4:** Not certified material. Paper has not been graded by PREPS. The publisher has a due diligence system. The publisher has conducted a risk assessment of the paper, which concludes low risks for illegal forest management.
- Score 5:** Not certified material. No due diligence system and no risk assessment.

The report then suggests that their members use this scoring system to set targets for action and to measure their performance regarding responsible paper sourcing.

These environmental initiatives are specific to forestry, and do not include the environmental impact of actual paper production, as timber is manufactured into paper. In terms of legal regulation, the EU directive on industrial emissions (Directive 2010/75/EU) regulates the pollution produced as a consequence of paper and pulp production, alongside other industries, and thereby works to limit environmental impacts of paper produced in the EU.

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## EU directive regulates pollution from paper and pulp production

### Facts

#### Directive 2010/75/EU of the European Parliament and of the Council 2010

The directive on integrated pollution prevention and control was ratified on 24 November, 2010. A recast of 7 earlier, separate pieces of legislation, this directive lays down rules to prevent and control pollution into the air, water and land to avoid generating waste from large industrial installations. The legislation covers the following industrial activities: energy, metal production and processing, minerals, chemicals, waste management, pulp and paper production, slaughterhouses and intensive rearing of poultry and pigs.

According to the legislation, all installations covered by the directive must prevent and reduce pollution by applying best available techniques (identified by the European Commission), efficient energy use, waste prevention and management, and measures to prevent accidents. Member states of the EU are required to take the necessary measures to ensure installations are operated according to these principles to reduce pollution. To regulate this, industrial installations must apply for permits for approval of their operations.

Read more: [Directive 2010/75/EU of the European Parliament](#)

There are initiatives in the industry on European and global scale working towards lessening the environmental impacts of paper production at the manufacturing stage. CEPI (Confederation of European Paper Industries) is the European association representing the paper industry and has long been working towards environmental goals. They report that within the industry, 92% of raw materials are sourced in Europe and certified as sustainable, 91% of the water used is returned in good condition to the environment, and there is a 71.6% recycling rate. Their collective efforts work to push European paper production toward competitive, sustainable, net-zero carbon solutions. However, there are not initiatives working at the same level in this process of the node as there are for forestry.

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## CEPI is pushing the European industry toward greener goals

## Possible Initiatives to Improve Environmental Impact

### 1. Employing the Norwegian Scoring System:

The Norwegian report is largely relevant to the Danish industry, and its findings and scoring system could be implemented in Danish production (see **Fact Box**).

**Barriers:** This would limit publishers to working with printers that are FSC- or PEFC-certified and would add extra administrative regulation for the publishers to develop and communicate their policy, and to document improvements and attempts to meet targets. This requires sufficient capacity and resources.

### 2. Support for Small Publishers:

Considering there are fewer small publishers in Denmark using FSC-certified paper in their products as discussed in **Chapter 2**, more should be done to understand the barriers that inhibit their use of certified paper. With this knowledge, extra measures could be set in place to support them in sustainable paper sourcing.

**Barriers:** In the instance that particular types of paper required for specialised production, such as photo books, graphic novels or art books, cannot be sourced as FSC-certified, then it would be difficult to alter the paper-use of the smaller publishers. However, more research is needed on this area in order to understand the paper choices and thereby fully understand the barriers.

## 3. Production of Further Materials

### Important Actors

- The printer (*Trykkeriet*)
- Their supplier (*Underleverandøren*)
- The publisher (*Forlaget*)

This node in the value chain includes the production and transportation of other materials necessary for production, predominantly **adhesives** and **ink**. The supplier of the materials has full control over the production process and the printer has full purchasing power, since the printer uses the same adhesives and ink, optimised for their production process, for all of their products. This is therefore an area where the publisher has very little say, as indicated by interviews with representatives from Gyldendal, Lindhardt og Ringhof, JP/ Politikens Hus Forlag, and DJØF Forlag.

### Environmental Impact

In relation to paper, these materials and their production determine a smaller portion of the environmental impact of book production. However, harmful, polluting chemicals can occasionally be used in their production, and the materials necessitate transport from the supplier to the printer. According to the 2006 life cycle analysis of the printing process (Danish Ministry of the Environment), ink production accounts for 17% of printed materials' environmental

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**Environmental  
impact from  
emission of chemicals  
in production**

impact, mainly due to emission of synthesis chemicals during the production of pigments and the energy consumption in production. For more information, see the 2013 EUPIA report, *'Environmental Impact of Printing Inks'*.

### Current Initiatives in the Industry

As illuminated through my interview with Hans Peter Nissen (DBK and JP/ Politikens Forlag), this area is subject to a wide range of EU regulations through the Industrial Emissions Directive ratified in 2010. This directive regulates the emissions and pollution caused by the production of solvents, including ink and adhesives.

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**EU directive regulates industrial emissions from solvent production**

As most printing for the Danish publishing industry is carried out within the EU, the ink and adhesives used in production generally fall within the remit of this legislation and the controls in place to enforce the emissions limits and other polluting outputs of organic solvents. This helps to limit the environmental impact that ink, adhesive and varnish production would otherwise have without regulation.

## Facts

### Fact Box: Directive 2010/75/EU of the European Parliament and of the Council 2010 (Cont.)

This directive on industrial emissions (integrated pollution prevention and control) also regulates the production of solvents. The manufacture of ink, adhesives, varnishes and coating mixtures by mixing of pigments, resins and adhesive materials with organic solvent or other carrier, including dispersion and predispersion activities, viscosity and tint adjustments and operations for filling the final product into its container are covered by this legislation. The legislation thereby sets emission limits to the production process to minimise its pollution and regulates other polluting outputs of organic solvents from production (such as organic solvents contained in collected waste or wastewater).

Furthermore, as evidenced by the members' survey, several publishers have some products certified by either the Nordic Swan Label or the EU Ecolabel (more information in section 4. Printing and Binding). Beyond setting emission limits, these certifications set particular restrictions on the exact substances that cannot be used in production. This includes a long list of hazardous substances and mixtures. The labels also exclude the use of many toxic

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**Swan Label and Ecolabel used by some publishers to regulate solvents**

metals, including cadmium, copper (excluding copper-phthalocyanine), lead, nickel, chromium VI, mercury, and arsenic from production of ink, toners, varnishes, foils and laminates. With these extra requirements, the labels go beyond restrictions set in place by legislation. This limits the risk of hazardous waste and pollution and ensures the recyclability of the paper.

Despite these initiatives, both legally binding and optional, the full environmental impact of ink production is not neutralised – simply minimised.

## Possible Initiatives to Improve Environmental Impact

### 1 Employing the Swan or EU Ecolabels:

As described in more detail section 4. **Printing and Binding**, one option to minimise the environmental impact of this node is to encourage more Danish publishers to meet certification requirements for either the Swan or the EU Ecolabel.

**Barriers:** This does set very strict environmental standards and regulations for the products, and getting the certification requires a payment as well as administrative work to regulate and document compliance with requirements. This is therefore dependent on publisher capacity.

## 4. Printing and Binding

### Important Actors

- The printer (*Trykkeriet*)
- The publisher (*Forlaget*)

The publishers begin this process by making an order with the printer. This order includes specifications about paper quality, layout, binding, treatment and other design aspects. The printer then provides a quote for the cost of production, and if approved, production is started. Files sent by the publishers are processed and converted into files that can be operationalised by the printers. These files are approved by the publisher, and printing begins.

For offset printing, an inked image is transferred (or “offset”) from a plate to a rubber blanket, then to paper in a lithographic process. Aluminium plates (*trykplader*) are created from the approved files and inserted into the offset machine. Offset printing includes considerable start-up costs, due to the production of the printing plates, but once set up, it provides accurate colour reproduction and crisp, clean prints. It is therefore considered optimal for large production volumes.

Digital printing, on the other hand, entails output transferred directly from electronic files onto the printing surface, using either toner or liquid ink. Digital printing is fast and flexible, if variation is needed between prints. Digital print is therefore often a cheaper and more optimal choice for low-volume production. However, digital print results in slightly lower quality, higher cost for large-volume prints, and fewer options in colour and print materials.

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**Offset  
vs. digital  
printing**

According to interviewees, most Danish publishers utilise offset printing for large orders, although DJØFs Forlag employ digital printing for most of their products (apart from hard cover books, which are offset). Interviews also revealed that most large Danish publishers rely on printers in Germany and the Baltics (particularly Lithuania). There is also some production in Poland. Of the publishing houses interviewed, only JP/ Politikens Forlag and DJØFs Forlag



have considerable amounts of printing done within Denmark. JP/ Politiken use the printers Nørhaven for approximately 55% of their production (according to interview with Tomas Henriksen, JP/Politikens Forlag), and DJØFs Forlag work predominantly with Danish-based printers, including LaserTryk and Ecograf. Other printers mentioned were Livonia Print (Lindhart og Ringhof) and GGP Media (JP/ Politikens Hus Forlag).

## Environmental Impact

The environmental impact attributed to the printing process is dependent on a series of variables, including the printers' energy source, energy efficiency, amount and types of inks employed, and the quality and lifetime of the machinery employed in printing.

As stated previously, the 2006 life cycle analysis study (Danish Ministry of the Environment) weights the environmental impacts of different stages of printing as follows: Paper production (31%), Printing (41%, thereof 17% points from ink production), Cleaning (17%), Energy at print (6%), Plate making (2%, assuming the aluminium plates are fully recycled), Page production (2%), Finishing (>1%). In the 2016 South African study, it is found that the printing process accounts for 39% of energy consumption in the production of books, the second highest level, following paper production. Considering this level of energy consumption, it is therefore paramount to consider the source of energy used in this process. Polish production, for example, still relies predominantly on coal as a source of fuel, which is far more harmful than fuel sourced from renewable resources.

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**Danish study finds printing accounts for 41% of environmental impact of printed material**

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## Offset and digital printing have different environmental impacts

The choice between offset and digital printing bring each their own environmental challenges. With offset printing, the use of aluminium materials for new print plates requires a great deal of resources. There is also some waste, due to the first printed batches being unfit for the market. However, the machines themselves are incredibly long-lasting (Nørhaven have used the same machines since the 1980's). Alternatively, digital printing machines have much shorter lifespans and need to be updated often.

## Current Initiatives in the Industry

Considering the significant environmental impact at this node in the value chain, there has been a series of developments within the printing industry itself to establish initiatives towards environmentally conscious printing, and product-specific certifications have been created to regulate production and communicate its criteria to consumers.

In Denmark, Grafisk Kommunikation og Medier (GRAKOM), the Danish interest organisation for the graphic industry, are a leading advocate for environmentally conscious printing. As

<sup>2</sup> In measuring environmental impacts, the study uses the impact categories defined by the EDIP (Environmental Design of Industrial Products) method, a Danish environmental method, which measures environmental impact as impacts on global warming, stratospheric ozone depletion, photochemical ozone formation, acidification, nutrient enrichment, persistent toxicity (both ecotoxicity and human toxicity) and landfilling and other forms of waste generation (Wenzel and Altling 1999).

the membership organisation for Danish printers, GRAKOM have established an array of support programs to assist Danish printers in environmental initiatives. They have a team of environmental consultants hired to provide advice, have developed a comprehensive CSR-code that their members can implement, and initiated and supported a series of studies to inform the improvement of the Swan Label and the Ecolabel. With this level of expertise, GRAKOM is able to provide a wealth of information about the actual environmental impacts of the printing process.

## GRAKOM a leader of environmental printing in Denmark

### Facts

#### GRAKOM Environmental Initiatives

**Environmental consultants:** GRAKOM have a team of environmental consultants in their environmental department, who can be optionally hired by their members to provide advice on how to best implement environmental practices, their CSR code or give any other environmental advice needed. With specialised knowledge specific to the printing industry, they are therefore able to provide targeted advice that is directly relevant to the processes of printing.

**‘Når kunden spørger om miljø...’:** GRAKOM have developed a series of informational materials to support printers in communicating the environmental impacts of printing to their customers. These guides include information about certifications, recycling, developments of sustainable plastic foils, allergies and sustainability more generally. These can all be accessed on their [website](#).

**CSR-code:** They have also developed a CSR-code, based on the 10 sustainability principles of UN Global Compact, which they offer to help any of their members implement if they wish. This CSR code includes environmental regulations that cover climate, recycling, chemicals, and wastewater and volatile organic compound emissions. The code can be read [here](#).

According to GRAKOM, there are three main certifications that apply best to the printing industry, and which should be considered by publishers when selecting their printers:

1. **Nordic Swan/ EU Ecolabel:** This certification is important because it is specified to the product and is determined based on in-depth lifecycle studies of its production. It can therefore set demands specific to the most relevant stages of the lifecycle. For the consumer, the Swan or Ecolabel is one of the best indicators of environmentally conscious production.
2. **FSC-Certification:** FSC sets tight regulations for forest management and biodiversity, and thereby scrutinises one of the most important aspects of book production.
3. **ClimateCalc:** ClimateCalc is a greenhouse gas calculating tool, which allows printers to calculate their over-all greenhouse gas footprint and the footprint of each individual product. This allows the printer, publisher and consumer to see where the highest environmental strains in production are and to benchmark products and printers against each other.

Interviews revealed that only few printed products for the Danish market are either Swan or Ecolabel certified. And although ClimateCalc is utilised in many European countries (15 printers in Denmark are certified), German printers use a different climate calculation tool, which makes it difficult to compare them. This being said, ClimateCalc certifications are not yet widespread enough to provide a proper means to compare printers broadly across the industry, even in other European countries.

### Important Certifications for Printed Matter



**The Nordic Swan** is the official Nordic environmental certificate, established in 1989 by the Nordic Cooperation (Nordisk Ministerråd). The certificate sets requirements for the environmental impact of both the printers and the individual product, with its point of departure in the lifecycle of the product. These requirements are evaluated on the basis of raw materials, chemical additives, and production processes and are frequently updated. There are also standards for the quality of the product, its packaging and waste management throughout its production. In the printing industry, the Swan label limits the use of environmentally and health damaging chemicals, and also sets requirements for the paper employed, amounts of waste and waste management. Criteria and certification managed by Miljømærkning Danmark. For more information: <https://www.ecolabel.dk>



**The EU Ecolabel** is the official European environmental certificate, established in 1992. The certificate sets high environmental standards applied to the entire life-cycle of a product, from raw material extraction, to production, distribution and disposal. The Ecolabel provides exigent guidelines for companies to help lower their emissions and provides guidance on eco-friendly best practices. As of September 2019, 1,623 licences have been awarded for 77,358 products (goods and services) available on the market. For printed paper, the ecological criteria for the Ecolabel include the paper and other materials used, recyclability of the product, emissions from production, waste, and energy usage. The EU Ecolabel criteria for paper products were updated in 2019, and can be read in full [here](#). For more information [ec.europa.eu](https://ec.europa.eu)



**ClimateCalc** is a tool for calculating the carbon footprint of both individual printed products as well as the printing company. A company is ClimateCalc certified when the calculation tool is taken into use and externally audited. The certification provides the company with a certificate to document the company's carbon account and ensure its correct use of the tool. ClimateCalc provides an important climate management function, as it allows the company to scrutinise the essential areas of production and set targets for improvement. Furthermore, it becomes possible to benchmark your company against others and therefore encourages improvements throughout the industry. ClimateCalc is based on the international Greenhouse Gas Protocol and the standard for carbon calculation that the European trade organization Intergraf adopted in early 2010. In addition, the ClimateCalc calculation tool observes the requirements for the development of carbon accounts in accordance with ISO 14064-1. Read more about the standards and data underlying the calculations on the website of ClimateCalc here: <https://dk.climatecalc.eu/>

### Important Certifications for Printed Matter



**Cradle-to-Cradle Certified** is a globally recognised measure of safer, more sustainable products made for circular economy. Both individual products and companies can receive the certification. The Cradle to Cradle Certified Product Standard is rooted in the Cradle to Cradle® design principles and standard requirements are developed through a stakeholder engagement process with input from technical experts, market leaders and the public. To receive certification, products are assessed for environmental and social performance across five critical sustainability categories: material health, material reuse, renewable energy and carbon management, water stewardship, and social fairness. Products are assigned an achievement level for each of these categories, and the lowest category achievement level sets the overall certification level.

For more information visit their website: [www.c2ccertified.org](http://www.c2ccertified.org)



**ISO 14001** specifies the requirements for an environmental management system that an organization can use to enhance its environmental performance. ISO 14001 is applicable to any organization, regardless of size, type and nature, and applies to the environmental aspects of its activities, products and services that the organization determines it can either control or influence considering a life cycle perspective. ISO 14001 does not state specific environmental performance criteria. It is a requirement that the organization regularly documents environmental improvements by setting targets and action plans for their relevant environmental impacts.

Read more here: [www.iso.org](http://www.iso.org)

In addition to certifications, some Danish publishers have had success with implementing Print-On-Demand technology for smaller production volumes, especially for publications that only sell low quantities throughout the year. The Danish printers LaserTryk, for example, provide a service called 'OneBook' where one box of copies is printed automatically once the warehouse supply reaches a certain level (i.e. 2 copies). Print-on-Demand technology thereby limits the risk of overproduction while also minimising re-print costs. As a digital print form, however, it remains more expensive and unideal for large volume production and cannot provide quick enough turn-around time for orders where demand is consistently high.

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**Print-on-demand  
technology also utilised  
in the industry**

## Possible Initiatives to Improve Environmental Impact

### 1. Set Demands for Climate Calc:

The Danish printers Nørhaven were ClimateCalc re-certified in 2019 because one of their largest customers requested it. This illustrates the influence publishers can have on supplier behaviour and choices. By requesting ClimateCalc certifications from their printers, publishers will help to make the certification more widespread and assist in standardised carbon measurements throughout the industry, providing a tool to improve production and set comparable targets. By standardising the measurement method employed by Danish publishers, this enables more transparency and ease in establishing common goals as desired by members in the membership survey.

**Barriers:** Considering ClimateCalc is not used in Germany, this would exclude working with large number of European printers, and some printers may deny getting the certification if there is not enough demand from other customers.

### 2. Lobby for standardised EU measurements:

Considering the value Danish publishers place on transparency and shared goals, it could be pertinent for Danske Forlag to lobby for EU policy to establish uniform measurements and reporting within the industry, so that all printers in the EU are using the same means to measure and report their climate performance. This could simply include extending the use of ClimateCalc to German printers, which currently use f.ex. ISO 50001 and 'Klimaneutral Drucken' under ClimatePartner as their measuring tools. Such standardisation in measurement and reporting is also a goal for Dansk Erhverv and the Danish government's Klimapartnerskaber.

**Barriers:** Influencing the choices of printers outside of Denmark is a difficult goal for Danske Forlag to achieve and would require support and collaboration across Europe.

### 3. Develop a scoring guide for printers:

Inspired by the scoring guide developed by the Norske Forleggerforening for paper sourcing, Danske Forlag could develop a similar scoring system for printers to inform members choices and facilitate motivation for improvements. This would also help the publishers set targets for improved environmental impacts of individual products. This guide should include considerations for elements such as the printers' certifications, energy source and consumption, waste management and transport providers. Such a guide could be developed as part of a partnership with GRAKOM, as a means to best utilise their knowledge and experience in this area.

**Barriers:** Implementing such a guide would require centralised and internal administration and regulation to monitor whether publishers are living up to the recommendations and improving, which requires significant capacity.

### 4. Investments in Print-on-Demand technology:

To improve its capabilities to better serve the needs of publishers, it may be worth encouraging investments in optimising print-on-demand technology for book production and larger print volumes.

**Barriers:** Availability and development of technology is largely outside the control of the publishing industry, and relies on several actors, entailing slow developments. As a digital form of printing, it is likely that print-on-demand will only ever be relevant for particular types of products with low print volumes.

## 5. Transport to Warehouse

### Important Actors

- The printer (*Trykkeriet*)
- The delivery supplier (*Transportfirmaet*)
- The publisher (*Forlaget*)
- DBK

In this node of the chain, printed books are transported from the printers to the warehouse in Denmark. In most cases, books are delivered to warehouses managed by DBK (who store ca. 90% of books for the Danish market). However, Morten Ladewig (Gyldendal) reported that some books purchased directly by large retailers, i.e. the COOP Supermarkets, are not stored with DBK, but in storage units managed by the publisher before delivery to the retailer.

The type of transport employed in this node is decided by the printers, as they make agreements with delivery suppliers, who transport the books. In this process, the publisher can ask questions and make requests regarding transport forms employed. Through interviews, it became apparent that most of this transport is conducted via the use of lorries, although responses to the membership survey also mentioned occasional use of airplanes.

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**Printers are responsible for transport from printers to warehouse**

### Environmental Impact

International transport is an important contributor to environmental impacts, not just in the publishing industry but throughout the Danish economy. International transport was in 2018 responsible for 46% of greenhouse gas emissions caused by Danish economic activity. From an EU perspective, 27% of total EU-28 greenhouse gas emissions came from the transport sector in 2017, with heavy-duty vehicles accounting for 26% of road transport CO<sub>2</sub>. It is also one of the only sectors measured by the EU that has seen a rise in emissions since 1990.

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**Distance traveled and transport form effect environmental impact**

The environmental impact of transport from printers to warehouse is determined by both the distance travelled and the transport form used. As mentioned previously, much printing for the Danish industry is conducted within the EU, with some production within Denmark. Occasional products, predominantly children's books translated from other languages and including built in toys, are printed in China (interview with Christian Davidsen, Lindhart og Ringhof). In using lorries to transport the majority of books, this node in the value chain is responsible for the emission of greenhouse gases and air pollutants. The further the distance from printer to warehouse, the larger this impact.

### Current Initiatives in the Industry

An interview with Fie Lauridsen (Nørhaven Printing) revealed that some Danish printers have made considerations regarding this impact. Since most books for the Danish market are headed to the same destination, it is easy to bundle deliveries and orders and maximise



transportation space and time. It is unknown if other printers used by the Danish publishers have made the same considerations.

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## The Danish industry mostly relies on lorries for their deliveries

### Possible Initiatives to Improve Environmental Impact

#### 1. Choosing a ClimateCalc certified printer:

When using printers that are ClimateCalc certified, the first point of delivery from the printer to the distribution centre is included in their overall carbon measurements, making it possible to compare printers on their choice of transport suppliers and methods.

**Barriers:** This once again limits the choice of printer, excluding printers in Germany.

#### 2. Exploring electric transportation alternatives:

Exploring the extent to which electric trucks or trains can be implemented in distribution, powered from sustainable sources of electricity.

**Barrier:** The current technology available is severely limited in the distance electric cars can travel before needing to be recharged, especially when carrying heavy loads. Meanwhile, zero emission trucks available are limited in supply and costly and the infrastructure of charging stations around Europe remains limited. Train infrastructure between European countries and within Denmark is not optimised for the publishing industry's needs. For example, there are currently no industrial train connections to Køge, where DBKs warehouses are located. Truly improving the transport choices available is a political matter beyond the remits of the industry, which requires fundamental investment in infrastructure and technology at a national and regional level.

#### 3. Striving for truck fuel efficiency:

In a letter to the President of the European Commission in 2018, a large group of companies (including IKEA, Unilever, Carrefour and Nestlé) requested the implementation of ambitious truck fuel efficiency standards in the EU. According to their letter, truck fuel efficiency standards are one of the most effective ways to achieve lower emissions in the transport sector, in combination with good management of truck operations, maintenance and driver training. Publishers can make requests that their printers choose fuel efficient transport suppliers, that can document this sufficiently. This would further help to create measurable, uniform standards in the industry. Until such standards are implemented in legislation, Danske Forlag could assist in implementing internal industry guidelines.

**Industry- and structural-level barriers:** Without legally binding standards, this area becomes difficult to regulate and enforce. Furthermore, the ability of current transport providers to live up to such standards remains unknown and would require further research.

#### 4. Support for The Climate Partnership for Transport:

As part of the Danish government's climate partnerships, a report has been developed which outlines central recommendations for bringing down emissions attributed to industry transport. The report includes recommendations and initiatives to expand the use of eco-friendly vehicles and eco-friendly, alternative propellants. Danske Forlag could lead the support of the publishing industry in backing up these centralised initiatives.

**Barriers:** As an initiative largely dealing with a sector outside of the influence of Danske Forlag, this is an area in which the industry has little influence and must depend on the collaboration of other actors.

## 6. Storage and Sorting

### Important Actors

- The publisher (*Forlaget*)
- DBK

As mentioned above, approximately 90% of books for the Danish market are stored in warehouses managed by DBK. The main purpose of DBK is to develop and streamline trade and communication in the Danish publishing industry. Through their role, much of the logistics and transport for the industry is centralised, with DBK responsible for storage, packaging and distribution. As a key actor, DBK have a great deal of decision-making power that influences the environmental impacts of the actions within the chain.

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**DBK have an important role centralising transport and logistics for the industry**

Most books delivered are first stored in the main warehouses in Køge or Haslev. Here books are sorted and distributed to smaller terminals around the country (for example Rødovre) depending on their final destination. Books are stored until they are distributed either to individual final consumers, who purchase the books directly online, or to retailers (see more in section 8. **Distribution to Retailers/ Final Consumers**).

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### Environmental impact from warehouse energy consumption

### Environmental Impact

The majority of the environmental impact in this node of the value chain derives from the energy source and consumption in the warehouse buildings and their climate control, and the operation of the conveyor belt technology employed in DBKs procedures. According to Hans Peter Nissen (chairman of the board for DBK), the conveyor belt machinery is from 2003, when the warehouses were built, and may not be as energy efficient as possible. Furthermore, there is an environmental impact as books are transported from one warehouse to another.

### Current Initiatives in the Industry

DBK have already taken some measures to limit the environmental impact of the operation of their warehouses by installing sensor-operated lights. This ensures that unnecessary electricity is not wasted due to lights being left on in empty rooms.

### Possible Initiatives to Improve Environmental Impact

#### 1. Energy source:

One possible initiative is to have all of DBKs buildings run on green energy, sourced from sustainable resources.

**Barrier:** This may bring a rise in costs and would require conversations about who is responsible for covering those costs.

## 2. Updated machinery:

Having the conveyor belt systems updated to more energy efficient models. In order to achieve this, DBK would have to measure how much of their energy consumption is dedicated to the conveyor belt systems and research the energy consumption levels of various alternatives.

**Barrier:** This would entail considerable upfront costs but may be an investment that provides lower costs over time if it facilitates reductions in energy-consumption. It is also important to consider the life-time of the machinery, and at what point it is environmentally viable to upgrade, when also considering the environmental impact of manufacturing of the systems.

## 7. Packaging and Preparation for Distribution

### Important Actors

- The publisher (*Forlaget*)
- DBK

As a consequence of their role in managing storage, DBK is responsible for preparing books for distribution. DBK have most of the decision-making power in this node, but it is possible for publishers to contribute in negotiations and developments.

Most books for the Danish market are delivered on pallets and are not wrapped in individual packaging, however, some German printers continue to wrap each individual book in plastic foil. Furthermore, the interview with Nørhaven Printers revealed that books ordered by COOP supermarkets are requested as packaged in bundles of 4 wrapped in plastic (but this is executed at the node of the printers).

At DBK, once sorted, books are packaged in accordance with their intended destination. For books being sent to individual final consumers, books are individually packaged by order. For bookstores and other retailers, daily deliveries are bundled together.

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**Books are packaged according to destination: retailer or final consumer**

### Environmental Impact

The main environmental impacts in this node derive from the source of material for packaging and how much packaging is utilised. The type of material utilised determines the energy consumption in production and resource use, resulting in a difference in environmental impact dependent on whether virgin paper or recycled paper is used.

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**DBK has only few, standardised packaging sizes which are not optimised for industry use**

Regarding the amount of packaging utilised, DBK currently only operates with few different standardised packaging sizes, due to the current machinery in place. Boxes are consequently often too big or ill-fitting

for the orders they are fulfilling. Not only does this mean packaging materials are often wasted, it also increases the risk of damaging the books. If books are noticeably damaged, they are typically not sold, resulting in more waste.

### Current Initiatives in the Industry

Most packaging used by DBK is made from recycled materials, with minimal negative environmental impact. According to the 2019 report on Responsible Sourcing of Printed Material by the Norske Forleggerforening, use of recycled paper-based products is considered an effective way to avoid use of controversial paper. Furthermore, the paper 'Environmental Aspects of Recycling' illustrates that not only does using recycled paper products preserve forests and combat resource depletion, but manufacturing recycled paper generates less pollution and uses less total energy than virgin paper.

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**Most packaging for the industry is made from recycled materials**

### Possible Initiatives to Improve Environmental Impact

#### 1. Variety in packaging sizes:

To more efficiently package books and minimise waste of resources, DBK could consider investing in technology to offer multiple packaging sizes optimised for different orders.

**Barrier:** This would entail some up-front costs at the point of investment but may lead to long term savings as returns caused by damage are reduced and packaging use optimised.

#### 2. Support the Climate Partnership for Trade:

Danske Forlag can lead the industry in supporting the packaging initiatives included in the government's [Klimapartnerskab for Handel \(the Climate Partnership for Trade\)](#). This report includes prioritised recommendations for establishing effective, common packaging principles and reform of the Danish waste system to accommodate the circular economy. This will also work to set standardised rules for waste across all municipalities in Denmark, and holistically lift the levels of recycling possible.

**Barrier:** As an area requiring governmental support, the ability for the industry to directly impact these changes remains limited.

#### 3. Develop a system for recycling packaging:

The UN Global Compact project, '[Verdensmål i Værdikæden](#)', is currently working with the Danish hospitality industry to develop environmental initiatives throughout their value chain. One area of focus is the development of environmentally sustainable packaging for take-away orders. They are exploring whether an efficient, environmental system for recycling take-away packaging can be developed, so packaging can be reused. The publishing industry could pursue a similar investigation, to see if a centralised recycling initiative would be worth implementing, where packaging is returned to DBK and reused for further orders.

**Barriers:** Implementing such a system would require a considerable amount of administration from DBK, retailers and Danske Forlag. This administration along with potential transport requirements would entail operational costs. It would also be necessary to evaluate whether the environmental impact saved from reusing packaging would outweigh the environmental impact of a potential recycling system, which would have to consider: 1) what extra environmental impacts would be caused by the system and 2) how many times can packaging actually be reused effectively.

## 8. Distribution to Retailers / Final Consumers

### Important Actors

- The publisher (*Forlaget*)
- DBK
- Retailers (*Forhandlere*)
- Transport supplier (*Transportfirma*)

After packaging is completed, books are distributed to their next destination. This is another task that falls within the remit of DBK and is therefore predominantly within their decision-making power. When books are distributed to retailers, their orders are usually bundled with their newspaper orders, and all of their wares are distributed together. These packages are first transported via lorry from the larger warehouses to the smaller terminals, and then from the smaller terminals to the retailers using vans. In some cases, smaller newspaper distributors are employed for the final distance.

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**Transport form  
and distance  
are vital factors**

When books are distributed to final consumers via internet orders, the form of distribution depends on the desires of those managing the internet shop. When books are ordered from the publisher's own website, the publishers decide which delivery service should be used (i.e. PostNord, GLS, DHL, etc.). When ordered from other online retailers (i.e. Saxo), the online retailer selects the delivery service. According to interviews, many of the big publishers in Denmark choose PostNord as their preferred delivery option.

### Environmental Impact

The main environmental impact here derives from the type of transport employed, and the amount of travel required. In predominantly using vans, this contributes to the emission of greenhouse gases and pollutants. Where books are delivered directly to the homes of the final consumer, there is often extra transport incurred in order to bring them to such a specific location.

### Current Initiatives in the Industry

Much transport is saved by the current model, through centralising and bundling orders for retailers. Since distribution occurs in the evening/ at night, transport times are kept efficient and minimal energy is wasted due to avoiding congested traffic.

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**Centralisation in the Danish industry  
keeps transport efficient**

## Possible Initiatives to Improve Environmental Impact

### 1 Finding the 'greenest' postal service:

To ensure packages destined for private homes are transported in the most energy efficient manner with the least environmental impact, an investigation into the vehicles and fuel efficiency of the different postal services could be undertaken, so publishers and online retailers can make informed decisions regarding suppliers.

**Barriers:** This limits publishers in their choice of delivery services, and heavily depends on accurate reporting from the delivery services, which the publishers cannot control or regulate. In order to make a truly informed decision, the different delivery services would have to use standardised measurements.

### 2 Implementing electric vehicles:

This would involve examining where in the delivery routes it would be possible to implement electric vehicles. This should be possible for distribution in larger cities with more available charging infrastructure.

**Barriers:** Realisation of such an initiative would depend on the supply and quality of electric vehicles to meet distribution needs, with significant start-up costs.

### 3 Striving for fuel efficiency:

As mentioned in section 5. **Transport to Warehouse**, ensuring fuel efficiency is important to limiting the environmental impact of long-distance transport. DBK could systematise demands to this end and ensure they hire transport suppliers that measure and report on their efforts in this area.

**Barriers:** The same barriers apply here as in section 5.

### 4 Sustainable Network Delivery Systems:

In the event of home-delivery, a sustainable network delivery system could be developed, to save on multiple legs of transport. Such a system involves a network of centralised pick-up points, such as kiosks or supermarkets, which consumers already frequently visit. Their book orders would be delivered here, for them to pick up on their next visit. It is crucial these points are places the consumer frequently visits, so extra transport is not necessary.

**Barriers:** Implementing such a system would require collaboration with the delivery services and may cause inconvenience to certain customers, for example disabled customers who have barriers when it comes to mobility. Furthermore, measuring its success would require information regarding the behaviour of the consumer (i.e. transport form or extra travels that otherwise would not have occurred), which would be difficult to collect.



## 9. Recycling of Purchased Books

### Important Actors

- The publisher (*Forlaget*)
- The municipality (*Kommunen*)
- The consumer - both private and institutions (*Kunden*)

It is important to note that there are two different types of recycling of books:

1. Books are disposed of and their materials recycled
2. Books are passed from one consumer to another and given new life as a book

In the first instance, it is the choice of the consumer whether or not to dispose of a book, and the publisher has no control over how they do so. Furthermore, different municipalities throughout Denmark each have their own waste disposal sorting systems, so regulations on disposal vary from place to place. Decisions of the municipality thereby affect the options available to the consumer. In the second instance, a book is either donated to a charity shop, a library or gifted to a new reader. Other initiatives, such as book swapping shelves often found in hostels or at train stations, offer another option. There is an opportunity here for the publishers to consider the possibilities of a more integrated, centralised recycling system, however these are not without their complications in preserving the interests of all actors in the industry, from author to publisher to retailer.

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**This node  
depends on  
the behaviour  
of the  
consumer**

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**If books  
end up in  
landfills, they  
contribute  
to methane  
emissions**

### Environmental Impact

The form of disposal determines the environmental impact. If the book is recycled correctly according to the rules of the municipality, its resources can be reused for other paper products. However, if books are disposed of as general waste, they are burnt along with the rest of the general waste, essentially serving as fuel. If paper is neither recycled nor the heat from incineration exploited as a source of energy or fuel, paper that ends up in landfills contributes to emissions of methane into the air from the anaerobic degradation of the cellulose in the paper (Danish Ministry of the Environment). Disposal therefore has the ability to sway its overall environmental impact, and there is an environmental incentive to extend the life of the book, to minimise waste and maximise its use.

### Current Initiatives in the Industry

In September 2019, Indeks Retail, the operating company behind Bog & idé and BOGhandleren, introduced a 'returpant' (deposit refund) system for books in their Bog & idé stores. The intention of this system was to enable the recycling of books, so they could have more than one life. The idea is that customers can return bestsellers, which will then be resold for 50% of the original price. When the customer returns a bestseller, they then receive a gift voucher for 25% of the price they paid for the book they have returned.

Despite having been in place for more than half a year, however, the deposit refund has not been very widespread, with only 293 books returned and 185 of them resold.

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**Indeks Retail introduced a deposit refund system to encourage recycling**

## Possible Initiatives to Improve Environmental Impact

### Support for the Climate Partnership for Waste, Water and Circular Economy:

The report for the government's Climate Partnership for waste, water and circular economy outlines the ambitions for 90% of waste in Denmark to be recycled by 2030. There are thus centralised solutions being implemented at the country level to make standardised reforms of the waste system and increase the amount of recycled materials being used for production. They have recommended that support be provided so that recycled materials match the demands of the market, so that they can more easily be used in new production and standards for green purchases. These efforts will also work to support these developments in the publishing industry and create incentives for conversion to sustainable production.

**Barriers:** This is another area that depends on widespread collaboration and lies outside direct impact remit of the industry.

## 10. Return of Unsold Books

### Important Actors

- The publisher (*Forlaget*)
- DBK
- Retailers (*Forandlere*)

This node in the chain is influenced strongly by both retailers and publishers. Both actors have the power to decide when a book should be taken off the shelf and returned to storage, at which point it is returned to DBK.

In the current system, books returned by the retailer are bundled for distribution in the same vehicles that bring the evening's delivery. The retailers often reuse packaging they have received with earlier deliveries. Returned books, which are not to be shredded or recycled, are placed in the 'B-stock' storage unit at the warehouse. Once the entire 'A-stock' has been sold or distributed to retailers, DBK can use the books from the 'B-stock' to distribute to retailers submitting new orders.

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**Returned books are placed in the B-stock and redistributed**

### Environmental Impact

Environmental impacts in this node are predominantly driven by the transport, the use of packaging, and the risk of waste due to damaged books.

The current system requires repeated travel due to the billing system for books being marked down in price or set on sale. When a publisher decides to mark down the price of a book, copies bought at full price by the retailer must be physically returned to DBK. The retailers then receive a refund for these returns and order new copies at the reduced price. With this billing system, due to limitations of Bogportalen, there are extra emissions of greenhouse gases from the back and forth transport of books.

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**Repeated travel when books are marked down in price adding to impact**

Furthermore, according to my interview with Martin Steenberg (Bog & idé), there is some return in the industry due to damaged books. Because books in Denmark are regarded as a luxury good, most consumers won't buy copies that are visibly damaged. Those copies therefore get returned, relating to the issues raised in section 7. **Packaging and Preparation**

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**Damaged books can lead to increased returns**

**for Distribution.** Some damage is suffered particularly by books with dust jackets (smudsomslag). While many of the publishers are already in the practice of ordering extra copies of the dust jackets from the printers, so that damaged jackets can simply be replaced (Christian Davidsen, Lindhart og Ringhof), this has not yet been systematised to the level that this is something the retailers are aware of.

### Current Initiatives in the Industry

By sending returns with the distribution vehicles and managing a 'B'-stock of all publications, procedures in this node are already optimised to minimise the environmental impact of the industry. With the current transport system in place, there is no extra transport necessitated by returns. Furthermore, by reusing packaging and boxes from previous orders, retailers help to keep the environmental impact of this part of the process low.

### Possible Initiatives to Improve Environmental Impact

#### 1 Improved Packaging:

See section 7. **Packaging and Preparation for Distribution** for more information

#### 2 New returns procedure for mark downs:

Retailers, publishers and DBK could collectively develop a new billing system for books being marked down, whereby full price copies do not have to be physically returned to DBK's warehouses. This would involve an updating of Bogportalen.

**Barriers:** This will require collaboration between the publishers, retailers, DBK in order to update Bogportalen and find a system that works for all parties, which may incur implementation costs. However, in saving transport in the long run, this should make up for initial costs.

### 3 Distribution system for extra dust jackets:

To avoid return of books with damaged dust jackets, DBK, retailers and publishers could work together to develop a system whereby retailers can easily order new dust jackets from a stock of extras, which are managed and stored at DBKs warehouses along with further copies of the printed book.

**Barriers:** This requires further structural management and administration for the distribution of orders and must be carried out in a way that extra transport is not necessitated. It is also pertinent that there is not an overproduction of dust jackets by the printers, so as not to waste resources.

## 11. Shredding/ Recycling Unsold Books

### Important Actors

- The publisher (*Forlaget*)
- DBK
- Purchaser (*Kunden*)

Once a publisher decides to take a book out of print and no longer wants to use storage space on the title, existing copies are shredded or recycled. This process is managed by DBK.

At first books for shredding/ recycling are roughly sorted into large containers. These containers are put up for auction and sold as raw materials to other companies. In Denmark, the packaging company Hartmann often bids for the containers, using the books in their production of cardboard and other packaging materials. DBK estimates that approximately 75%-80% of the books are repurposed, with the remaining books being burnt as waste – effectively serving as fuel.

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**Many books  
are sold as raw  
materials to other  
companies and  
reused**

### Environmental Impact

To what end the books are recycled and the energy efficiency of the process determines the environmental impact of this node in the value chain. Recycling requires considerations as to how far the containers must be transported and the energy sources powering their manufacturing. If the books are not repurposed, the effects of their disposal must be taken into account.

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**The more precisely  
books are sorted,  
the more uses they  
can be recycled for**

The sorting of books before auction is also an important point of consideration in the environmental impact of this node in the value chain. The more precisely books are sorted, the broader the array of uses they can be sold for. The current sorting process is quite rough, and the books are therefore only able to be used for certain new products, which has a danger of leading to waste of resources if containers are not sold.

## Current Initiatives in the Industry

In recycling the books for future use this node already has strong environmental initiatives.

## Possible Initiatives to Improve Environmental Impact

### 1 More detailed sorting of books:

To ensure the recycling of the maximum number of books for their best possible purpose, it would be adamant to introduce a more differentiated sorting system.

**Barriers:** This would entail start-up costs at implementation stage, and potential ongoing administration costs, as the system requires more maintenance. However, if the system enables higher sales of containers, there may be higher returns over time.

### 2 Review and benchmark purchasers:

It may be possible to examine production procedures of the various purchasers, benchmark them against one another, and thereby set targets for their energy consumption, energy sources, amount of transport etc. At the very least, it could be mandatory that they report their carbon footprint or other measures of environmental performance.

**Barriers:** In order to be implementable, this would depend on all purchasers using same measurement tools and standards. As they all operate in different countries and all work in different industries, direct comparison would be extremely difficult.

## 12. Marketing

### Important Actors

- The publisher (*Forlaget*)
- The retailer (*Forhandleren*)
- The Marketing Team (*Markedsføringsteam*)

Like all products, books are advertised and marketed, with strategies developed for the individual publications or for the publisher's overall brand. Marketing campaigns include public displays, materials sent directly to retailers for display, and some materials, i.e. magazines and catalogues, distributed directly to final consumers. Here the publisher has the decision-making power to select the printers of marketing materials, the marketing team are responsible for the development of the campaign, and the retailers often play a part in the execution.

Not only does material production of marketing play a role in the industry's environmental character, as does the content. As discussed in **Chapter 2**, the publishers do not currently view environmentalism as a new opportunity for business development. However, effective marketing as a 'green' publisher can provide opportunities for breaking into new markets and can have a considerable impact on the behaviour of the consumer, changing their preferences for more eco-friendly products.

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**Material  
production of  
advertising has  
environmental  
implications**

## Environmental Impact

The entire production process behind the printed marketing materials has an environmental impact, similar to that of book production. The source of the paper in particular remains of paramount importance.

Additionally, there is an environmental impact when marketing materials are disposed of, particularly when they have gone to waste. Martin Steenberg (Bog & idé) presented the problem that retailers often receive unsolicited marketing materials (i.e. posters and flyers), but that the sizes and forms of materials are often not optimised for the needs of the retailer. As a consequence, many marketing materials are not utilised and are simply disposed of.

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**Printing process of marketing materials and their paper source are important**

## Current Initiatives in the Industry

During the course of interviews, no current initiatives in this area were made apparent.

## Possible Initiatives to Improve Environmental Impact

### 1. Choice of printers:

Marketing printers can be selected on the basis of their environmental performance, as informed by certifications. For example, the printers KLS Pure Print are a Cradle to Cradle certified, sustainable printer and could provide a viable option.

**Barriers:** This limits the choices of the publishers and may exclude some printers that provide specialised services.

### 2. A new distribution system:

To avoid marketing materials going to waste, a centralised system for distributing marketing materials could be developed. In collaboration between retailers, DBK and the publishers, an ordering system could allow retailers to order the sizes of marketing materials they desire and specify delivery times, so deliveries are bundled and optimised for use. A similar solution has been developed for the American industry, where marketing materials are delivered on a monthly basis. This model could be used for inspiration.

**Barriers:** Developing such a system would be a large administrative task and would need to serve the interests of several different actors.

### 3. Developing the benefits of green marketing:

To assist publishers in best utilising the green agenda to further business development, Danske Forlag could provide support initiatives to develop capacity in this area. Better understanding how to maximise returns to environmental initiatives can help to counteract some of the barriers impeding environmental transitions. For inspiration, see the EU published '[Marketing-Guide for EU Ecolabel Companies](#)'.

**Barriers:** This would involve organisation and administration across the industry in DK, which would require resources.



## 13. CSR and Internal Operations

### Important Actors

- The publisher and its employees (*Forlaget og dets medarbejdere*)

A company's Corporate Social Responsibility (CSR) is a self-imposed governance structure, where firms go beyond legal constraints to take responsibility for the impacts of their operations on society. CSR initiatives usually integrate social, environmental, ethical, and human rights concerns into a firm's business operations. This covers all day-to-day operations of the publisher and its offices in Denmark. Through a CSR agenda, a firm can communicate to its consumers about its production processes and ethics. As advocated by UN Global Compact, it is important for firms concerned with sustainability to look inwards before looking outwards.

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Looking  
inwards  
before  
looking  
outwards

### Environmental Impact

The environmental impacts of internal operations derive from a wide array of activities, including: consumption and source of electricity, how much international and national travel is undertaken in business operations, waste management, the choice of cleaning products used in the maintenance of company buildings, the types of food being prepared in the canteen, office paper use and its source, etc.

### Current Initiatives in the Industry

Several large Danish publishers already have comprehensive CSR implemented in their operations. JP/Politikens Hus publish a CSR-report every year, reporting annual efforts to incorporate social, environmental and ethical concerns into their business. Their 2019 report has a strong focus on environmental initiatives, citing that from 2018 to 2019 the company reduced their carbon footprint with 61%. Egmont, which encompasses Lindhart og Ringhof, similarly has a broad CSR enterprise with a heavy focus on environment and climate. However, as revealed by the members' survey, it is mostly the large Danish publishers that have set such internal goals. Of the medium firms, only 26% responded that they have set internal environmental goals, and among the small publishers only 14% responded 'yes'.

### Possible Initiatives to Improve Environmental Impact

#### 1. Encourage CSR development:

Danske Forlag could develop a means to assist its member publishers to develop their own CSR governance structures and reporting. In support of this, several organisations, such as [Miljøfyrtårn](#) offer assistance to provide an overview of which aspects of internal operations have an environmental impact and how goals can be implemented.

**Barriers:** Implementing and enforcing this governance system requires a great deal of administrative capacity and acquiring certifications to signal these efforts entails costs. This may therefore be more applicable to larger firms.

## 2. Setting industry-specific measurement and reporting criteria

As mentioned in **Chapter 2**, many of the publishers desire standardisation for the measurement of environmental performance to enable the implementation of common goals. Taking inspiration from the report on Klimapartnerskabet for Service, IT og Rådgivning (The Climate Partnership for Service, IT and Consultancy)<sup>3</sup>, a solution to this could be found in standardising the key numbers that must be included in climate and carbon calculations, thereby establishing a common 'language' with which the industry can report and compare developments. To this end, Danske Forlag could via Dansk Erhverv work towards the implementation of such standardised measurement criteria, based off existing methods and international best practice within this area.

3 Dansk Erhverv. (2020). Klimapartnerskabet for Service, IT og Rådgivning.

# Conclusion of Value Chain Analysis

As the value chain analysis reveals, the environmental impacts of physical book production are varied and widespread at all different levels of the chain. While the nodes with the largest environmental impact are those of paper production and printing, there are several initiatives that fall within the direct-action power of central actors in the industry throughout the second half of the chain. In considering which environmental initiatives to pursue and how common goals are set for the Danish industry, it is important to consider the capacity required by each initiative, how collaboration will be furthered, and how these initiatives can be measured and regulated. To that end, it is important that the barriers posed to publishers of all sizes are considered as we move forward.

## 4 Recommendations and next steps

On the basis of the preceding analysis and the concerns and ideas expressed by member publishers, this report proposes nine recommendations for how the industry can collectively move forward to pursue more environmentally conscious publishing.

Implementing these changes are pertinent, not just for the environment, but for the industry itself. Pursuing further environmentalism in the industry ensures that books will meet the needs of consumers as they grow more environmentally conscious and increase demands in this area. Importantly, this includes pre-empting demands that may be politically implemented for purchases by public institutions, such as libraries and education facilities, as the country pursues a holistic green transition. Furthermore, however, such transitions align with the ethos of the world of the book and of publishing. Just as the content of the materials published seek to generate knowledge and contribute to social well-being and development, the products themselves will be physical manifestations of internalising that learning and social consciousness. A greener book, for a greener world.

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**A greener book,  
for a greener world**

The recommendations selected have been chosen on the basis of their **feasibility**, **measurability**, and **proportionality** in relation to the challenges facing the industry. The feasibility of the recommendations is pertinent, as they must be realistically implementable to ensure achievement. In this respect, the suggestions and concerns expressed by publishers through the survey and interviews have been taken into account. Regarding measurability,

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**Feasibility**  
**Measurability**  
**Proportionality**

recommendations have been selected on the basis that publishers can measure and report their performance in each area, to enable the tracking of improvements and, crucially, allow the industry to set common goals and facilitate the standardisation that has been desired by members. The proportionality of each recommendation has been considered to ensure the initiatives tackle areas of the industry with the largest environmental impact.

In light of these conditions, the recommendations selected reflect a prioritisation of next moves for the industry according to the current context, but by no means do they exhaust all options or exclude future developments. As technology, infrastructure and available resources continue to change and present new opportunities for environmental publishing, the industry will necessarily have to incorporate these in their goals and collaborations.

## The Recommendations:

1. **Design:** Implementing a guide for 'eco-design'
2. **Paper:** Encouraging FSC-Certified paper
3. **Printing:** Establishing a printer selection guide
4. **Packaging:** Striving for packaging variation and minimised use
5. **Energy:** Transitioning to green energy and pursuing energy efficiency
6. **Transport:** Exploring sustainable alternatives and reducing unnecessary transport
7. **Reporting:** Working towards standardised industry measurement and reporting methods
8. **Support for National Initiatives:** Support for Klimapartnerskaberne for Handel (Trade), Landtransport (Transport), and Affald, Vand og Cirkulær Økonomi (Waste, Water and Circular Economy)
9. **CSR:** Striving for sustainability in internal operations
10. **Technology:** Supporting technological advancement and development

## 1. Design:

### Implementing a guide for 'eco-design'


This report recommends implementing a guide for environmental design. As illuminated by the value chain analysis, decisions made at the design stage have important implications for the environmental impact of the entire production process. Integrating environmental awareness in this stage will therefore have ramifications that carry throughout the value chain.

Considering the variety of printers employed by different publishers, with each their own production process, this guide cannot prescribe particular formats, layouts or materials for production. However, it can outline points of reflection to be taken into consideration in conversations with design teams and printer.

#### **Suggested categories for this guide are:**

1. **Format and size:** Does the format ensure minimal paper waste?  
Which standard formats are best suited to this publication?
2. **Page layout:** Does the page layout ensure optimal page count, to avoid paper waste?
3. **Binding:** Which finishings have been selected, and which materials do they require?  
Are there more environmentally conscious options available? Are any additional beautification elements being included, and what materials will these necessitate?
4. **Packaging:** Will the publications be individually packaged? Can this be avoided?
5. **Production quantity**
6. **Digital printing:** Can print-on-demand technology be utilised for this publication?

#### **Next steps for implementation:**

- 
1. Udvalget for grøn bogbranche to confirm the checklist for eco-design, which is inspired by the guide by SNE (The French Publishers' Association), and develop a system for annually reporting guide use
  2. Danske Forlag to circulate this checklist to all members and encourage its implementation, and make it publicly accessible
  3. Publishers to implement the check list in collaboration with suppliers and designers
  4. Danske Forlag and publishers to complete and publish annual report on the extent of the guide's use in the industry

## 2. Paper:


### Encouraging FSC-Certified paper

On the basis of the 2019 report on Responsible Sourcing of Printed Material by the Norwegian Forleggerforening, we evaluate that the most important goal for the Danish industry is to increase its use of FSC-certified paper. Although the industry already employs a large amount of FSC-certified paper in production, there is still room to improve. Considering paper production is one of the nodes with the largest environmental impact, this is an area that warrants active consideration from all members of the industry.

To fully facilitate this recommendation, it is important to understand the barriers that publishers experience in their paper sourcing in order to overcome them. It is therefore particularly pertinent to understand what currently informs paper sourcing and set measures in place to help overcome the barriers.

It will also be key for publishers to actively track their performance and communicate it to consumers, which will also allow Danske Forlag to set industry wide targets for paper sourcing and track developments. Embedded in this recommendation is therefore also the implementation of annual evaluation carried out by Danske Forlag to assess the performance of the industry.

#### Next steps for implementation:

- 
1. Publishers to develop and communicate a policy regarding paper sourcing, making a commitment to using FSC-certified paper to the best of their ability
  2. Danske Forlag to annually collect data on publisher performance and report industry-wide achievements
  3. Danske Forlag to set industry-wide goals and communicate these publicly
  4. Danske Forlag to establish a working group with smaller publishers to understand their paper sourcing choices
  5. On the basis of this research, Danske Forlag to engage in providing support to increase their use of FSC-certified paper

## 3. Printing:

### Establishing a printer selection guide

Considering the large environmental impact attributed to printing, a recommendation regarding choice of printer is pertinent in facilitating the move toward environmental production. This report therefore recommends employing a checklist guide printer selection.

Such a guide does not set ultimate demands for which printers publishers can or cannot collaborate with, but rather establishes guiding principles and highlights areas of concern. The



guide can also suitably be employed by publishers in negotiations with current suppliers, to request certain services and thereby push printers to deliver on environmental demands.

It is recommended that publishers develop and publicly communicate their policy on printer choice, set internal targets for implementation of the guide, and report their use of the checklist annually. To develop a guide that is truly reflective of best practice in printer selection, it is advisable that Danske Forlag consult with Intergraf, or other relevant European expert organisations, using their wealth of knowledge about environmental printing practices.


Based on the research of this report, it is recommended that the guide at minimum include considerations regarding:

- Is the printer FSC or PEFC-certified?
- Does the printer have any other environmental certifications, which are internationally recognised?
- Does the printer employ a certified and internationally recognised tool for measuring and reporting carbon emissions?
- Does the printer use green energy?
- Are green transport forms and sustainable transport guidelines (such as truck fuel efficiency practices) employed by the printer?

By including all of these elements, the guide not only takes into account the production practices of each printer, but also includes parameters that will help regulate the materials used in production (through setting goals for certifications), enable moves towards standardising carbon reporting, and set goals regarding energy consumption and transport in the industry. This initiative therefore takes into consideration many of the environmental impacts throughout the value chain.

While this is a first step to improving printer selection, we hope it can pave the way towards more ambitious goals, where impacts and improvements can be more easily and accurately evaluated.

### Next steps for implementation:

- 
1. Danske Forlag and its Udvalget for Grøn Bogbranche to approach European graphics and printings organisations for consultation
  2. Finalise a checklist guide for printer selection based on the recommendations outlined in this report
  3. Individual publishers to implement the new scoring guide by:
    - Developing and communicating a policy regarding printer selection
    - Setting internal goals informed by the guide
    - Monitoring and reporting their use of the guide annually
  7. Danske Forlag to collect and publicly communicate an annual overview regarding the use of the guide among members


## 4. Packaging:

### Striving for packaging variation and minimised use

As outlined in the value chain analysis, the current standardised packaging employed by DBK is often too large for actual industry demands. Not only does this involve use of excess materials, but also leads to suboptimal usage of space in transportation. In providing a broader variety of packaging sizes, there will also be a reduction in damage caused to the books. This is therefore an ideal area to implement a change, and one that falls within the direct mandate of the DBK and publishers.

Within this, there is packaging to be saved by centralising the distribution of marketing materials from publishers to retailers. The American Booksellers Association has implemented a solution to a similar problem. This has been titled the ['Red Box' program](#), where boxes are sent out to retailers on a monthly basis including signs, bookmarks, posters, catalogues and flyers from all publishers who wish to participate. This initiative could provide inspiration for how such a system could be implemented in Denmark, thereby saving on the amount of packaging and transport utilised in the industry.

#### Next steps for implementation:

- 
1. Research and select the ideal variety of sizes which meet industry needs
  2. Research the opportunity to use packaging materials that are certified by an internationally recognised certification for sustainable paper products
  3. DBK to research the costs of upgrading their packaging equipment
  4. Decisions about the funding for the upgrading of equipment
  5. Purchase and installation of new equipment
  6. DBK to research the possibilities for reusable packaging
  7. Danske Forlag to establish a working group of retailers and publishers to assess the current marketing distribution system and how it can be improved, identifying the needs from both parties
  8. Reach out to American Booksellers Association to learn from their experiences with the Red Box programme and how it has been realised
  9. Finalise new marketing distribution system and implement

## 5. Energy:

### Transitioning to green energy and pursuing energy efficiency

While many of the emissions and other environmental impacts attributed to distribution of books require changes at the structural level in order to be minimised or eliminated (i.e. introducing electric vehicles), changing the energy supply at DBK, the Danish collective distribution centre for books, falls within the realm of action the industry can take of its own accord. This report therefore recommends DBK transition to green energy supply and enforce energy efficiency, to lessen over-all emissions in the value chain.

### Next steps for implementation:



1. Further research to measure the actual energy consumption of DBK's warehouse procedures and machinery employed for sorting and distribution
2. Researching and selecting the greenest alternative for energy supply
3. Researching alternative conveyor belt machinery, and confirming the suitability of upgrading to reduce energy consumption and improve energy efficiency
4. Evaluate all areas of procedure where energy efficiency can be improved and implement necessary changes

## 6. Transport:

### Exploring sustainable alternatives and reducing unnecessary transport

Considering the importance of transport's environmental impact throughout the value chain, it is an area that warrants a great deal of attention. While transport from the printers to the warehouse falls under responsibility of the printers (as is addressed in Recommendation 3), transport from the warehouse to the retailers/ final consumers falls within the decisions of the Danish publishers. Although many transport alternatives are not currently widely available in Denmark, it is worth exploring the options that are currently accessible and implementing those best suited to the needs of Danish publishing. This includes, for example, employing electric vehicles in distribution where possible and working with the 'greenest' distribution providers when shipping directly to the final consumer.

It is also pertinent to remove the unnecessary transport necessitated by the current billing and returns system for books being marked down in price. To do so, it is necessary to implement a new system whereby books do not have to be physically returned to DBK only to be purchased anew by the retailers.

### Next steps for implementation:



1. Research viable alternative transport methods from warehouse to retailers and encourage use
2. Research how a truck fuel efficiency policy can be implemented by Danish publishers
3. Identify limitations in Bogportalen which determine the current billing and returns system
4. Collaboration between publishers, DBK and retailers to develop a new system to replace the old one, which excludes the use of extra transport

## 7. Reporting:

### Working towards standardised industry measurement and reporting methods

Throughout the research for this report, it has been evident that members strongly believe standardised measurement and reporting tools are necessary to ensure transparency and comparability in the industry.

This report therefore recommends that Danske Forlag, in collaboration with Federation for European Publishers, works towards building support for standardised industry-wide measurement and reporting criteria. This includes lobbying for the implementation of these standards across the EU. Nationally, this is an area Dansk Erhverv is actively engaging in to develop standardisation for industries across Denmark. Danske Forlag can draw inspiration from this national work in their international partnerships and actively support the initiatives pursued by Dansk Erhverv.

In extension of this, it is important that the industry establish collective, measurable goals in order to track developments. To this end, the report recommends that Udvalget for Grøn Bogbranche establish a unified vision for the industry, which should include a measured 'starting point', KPIs (Key Performance Indicators), and overarching goals, particularly regarding implementation of recommendations included in this report.

#### Next steps for implementation:

- 
1. Reach out to the Federation for European Publishers to begin setting terms for collaboration
  2. Establish collaboration with Dansk Erhverv to learn from the initiatives they are pursuing and provide support
  3. Udvalget for Grønbogbranche to establish industry goals and a system for tracking improvements and achievements

## 8. Support for National Initiatives:

### Support for Klimapartnerskaberne for Handel (Trade), Landtransport (Transport), and Affald, Vand og Cirkulær Økonomi (Waste, Water and Circular Economy)

With the industry facing so many structural barriers to lowering the environmental impact of publishing, this report recommends that the industry provide support for the national programmes, which are working towards introducing environmental solutions in nation-wide infrastructure and institutions. In providing active support, Danske Forlag can also serve to voice the interests and concerns of the publishing industry in the work of these national initiatives.

The Climate Partnerships with the most relevance for the publishing industry are identified as those for Trade; Transport; and Waste, Water and Circular Economy. These partnerships aim to:

- Advocate effective, collective packaging principles which adhere to environmental practices
- Reduce carbon emissions as a consequence of transport across the country and enhance access to sustainable transport forms
- Support a fundamental renovation of the Danish waste management system towards a circular economy

### Next steps for implementation:



1. Through collaboration with Dansk Erhverv, Danske Forlag can actively support the government's climate partnerships and the subsequent work for green business reforms

## 9. CSR:

### Striving for sustainability in internal operations

As mentioned in Chapter 3, it is also important for firms to look inwards alongside looking outwards when striving to minimise climate impact. Although the impact of Tier 1 emissions in the publishing industry is small, there are still improvements that can be made. This report therefore suggests that a checklist of considerations for CSR is developed and distributed by Danske Forlag to all member publishers, as a guide to how they can improve sustainability in their internal operations.

This checklist could include a series of questions inspired by the government's Klimapartnerskabsrapporter, such as:

- Do your buildings use green energy sources?
- Are your buildings optimised for most effective energy use?
- Is bottled water served?
- Are disposable cups and cutlery utilised for coffee and refreshments?
- Is the menu in your canteen climate friendly?
- Does your canteen have initiatives in place to reduce food waste?
- If you have company cars, are these electric?
- Does your company encourage use of sustainable transport methods?
- Have you minimised travel activity to the absolute minimum?
- Does your company sort all waste and ensure recycling is employed where possible?
- Has your company committed to employing circular economics?

**Next steps for implementation:**

1. Udvalget for Grønbogbranche to finalise a complete checklist
2. Danske Forlag to distribute checklist to members and encourage members to develop and publish CSR goals and progress

## 10. Technology:

### Supporting technological advancement and development

The potential for technological advancements to support a green transition in publishing is not only present in the transport sector, but in the very production processes behind the making of the book. It is therefore in the interest of the industry to collaborate with and support the work of research and technical institutes that have the ability to develop new, greener solutions to meet the needs of the industry. Such initiatives include, for example, developing more CO<sub>2</sub> friendly production materials, improving print-on-demand options, and exploring predictive marketing tools that can help to accurately predict market demand and thereby limit overproduction.

In pursuit of this collaboration, Udvalget for Grønbogbranche can explore opportunities for seeking financial support, i.e. from Innovationsfonden, to invest in the research and development of new technological solutions for a greener publishing industry. At the very least, a collaboration with research institutes could simply lead to learning more about the materials and processes of book production, and thereby lead to more informed decision-making.

**Next steps for implementation:**

1. Explore applying for available funds to apply for, both public and private, to support potential collaboration with research institutes
2. Udvalget for Grønbogbranche to reach out to relevant research institutes, such as Teknologisk Institut and the Alexandra Institute, to initiate collaboration



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Danske Forlag v. stud. MSc Global Udvikling Rebecca Vaa

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[www.danskeforlag.dk](http://www.danskeforlag.dk)

[info@danskeforlag.dk](mailto:info@danskeforlag.dk)