# Enhancing knowledge transfer and uptake in the design process of flood defenses

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*Figure 1.*
*Three elements of the Sender-Receiver framework.*

1. Observations 2. Diagnosis 3. Interventions

*Figure 2.*
*Single knowledge transfer transaction in the Sender-Receiver framework for knowledge transfer and uptake.*
*S = Sender*
*K = Knowledge*
*B = Barrier(s)*
*T = Trust*
*R = Receiver*
*N = Knowledge need*
*G = Grounds*
*F = Failure Mechanism(s)*
*U = Knowledge Uptake*

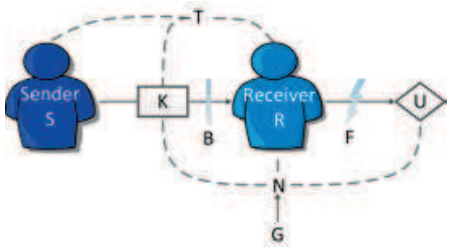


*Figure 3.*
*Barriers blocking knowledge uptake and transfer.*

| Barriers blocking knowledge uptake and transfer | | |
|---|---|---|
| **B1. Cognitive barriers** | *Cognitive barriers* occur when receiver R lacks prerequisite knowledge, or experiences cognitive dissonance, when the knowledge provided does not fit R's understanding of the real world. Differences in assumptions and frames of reference, or poor basic communication skills on the part of sender S and/or receiver R, may cause messages to be distorted. |  |
| **B2. Institutional barriers** | *Institutional barriers* arise when receiver R understands knowledge K, but cannot act upon it because such action is incompatible with current practices, or conflicts with some core values held by R or key stakeholders. The strength of these barriers is proportional to the degree an institution is able to adapt, and thus accommodate proposed changes. |  |
| **B3. Resource-related barriers** | *Resource-related barriers* occur when receiver R foresees financial consequences (e.g., when knowledge K includes measures that significantly improve safety, but are expensive), or potential risks (e.g., when K concerns a novel technology, or a policy that may lead to legal claims.) |  |



Ellen Tromp

# ENHANCING KNOWLEDGE TRANSFER AND UPTAKE IN THE DESIGN PROCESS OF FLOOD DEFENSES

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Flood risk management (FRM) has become a complex sociotechnical issue, one that requires a wide range of expertise from science, engineering, and behavioral disciplines. Any intervention in the flood defense system must meet the requirements of many different stakeholders. Although all stakeholders have a clear and common interest in enhancing safety from flooding, individual and organizational interests can diverge widely.

In the Netherlands, FRM entails mitigating flood risk by building dikes, dams and other hydraulic structures to regulate the water. Every 12 years all the Dutch primary flood defenses are tested to ensure they meet the statutory safety standards. When a flood defense fails to meet the standards, it is placed on the Dutch Flood Protection Program, and the Dutch water authorities are, among others responsible for strengthening the dikes.

As municipalities and private parties add functions on dikes, spatially integrating the dike into its surroundings becomes more important. Recently, regulations have changed, increasing the role of the Dutch water authorities as partners in spatial planning. Despite their changed role and growing pressure from other stakeholders, national and regional water authorities remain conservative: innovative techniques are rarely applied. Although the Netherlands is a worldwide leader in FRM research, actual policy appears inert, and many opportunities to innovate are missed.

In order to enhance knowledge transfer and uptake, the policy analyst / process designer must be able to diagnose a situation and foresee the consequences of an intervention. The framework developed helps to assist the analyst / designer to observe, diagnose and (ultimately) intervene in the knowledge uptake (see Figure 1).

As shown in Figure 2, in a single knowledge transfer interaction, knowledge K is transferred by a sender S to a receiver R. In a sequence of interactions, parties can change roles: the sender becomes a receiver and vice versa, or the receiver becomes a sender in interaction with a new receiver. Uptake of knowledge U can include a range from sharing knowledge through presentations or documents, to changes in policy in response to new insights. Recent changes in Dutch flood policy led to assessments against statutory standards every twelve years, instead of every five years.

We identify three preconditions for the transfer of knowledge:
P1 Sender S must have knowledge K that is relevant to receiver R; and
P2 Sender S must be willing to share knowledge K; which entails that
P3 Sender S must trust receiver R
(Connelly & Kelloway, 2000; Davenport & Prusak, 1998; Podolny & Baron, 1997).

For knowledge uptake U, we identify three more preconditions:
P4 Receiver R must have a particular knowledge need N;
P5 The knowledge K needs to fit this need (at least partially), but is not yet available to the receiver; and
P6 The receiver R must find the transferred knowledge (or some of it) trustworthy.

Levin & Cross (2004) found that knowledge transfer is more effective when the receiver views the knowledge source as being both benevolent and competent. We therefore differentiate between two types of trust T:

benevolence-based trust (the belief that sender S will not intentionally harm receiver R) and competence-based trust (the belief that sender S is knowledgeable about a given subject area). Interpersonal trust (Rotter, 1967) may not be necessary at the start of knowledge sharing, but it may develop over time as a result of knowledge transfer (Kramer, 1999; Ford, 2004).

The receiver's need N for knowledge K may have different grounds G. A decision-maker may, for example, commission an environmental impact assessment on substantive grounds (e.g., to improve the design of a dike, or to better understand the risk of a technological innovation), on formal grounds (e.g., because the analysis is required by law), or for strategic reasons (e.g., to defer a decision, or to gain support from some stakeholder group). These grounds may also affect the knowledge uptake.

Knowledge transfer and uptake may be blocked due to three types of barrier:

cognitive, institutional and resource related barriers (see Figure 3). Even when these barriers do not arise, or can be overcome, other failure mechanisms can impede knowledge uptake:

F1 *Incorrect use*: knowledge K is used by receiver R in different ways as for strategic reasons sender S did not intend, or because S misunderstood the grounds for R's knowledge need.

F2 *Diffidence*: Receiver R interacts with another actor, who questions the knowledge, thus weakening trust T, which dissuades R from taking up knowledge K.

F3 *No relay*: Receiver R does take up knowledge K, then R becomes sender S2 and interacts with a new receiver R2. Uptake of knowledge can fail if R2 is not receptive.

The proposed framework appears to function as intended, and helped us identify and clarify the uptake of knowledge (or lack thereof) in a FRM planning process. The behavior of the parties and their interventions are coherent with the identified barriers. Further research should reveal whether the framework can facilitate timely identification of barriers and failure mechanisms in 'live' case studies, and in this way support the design of effective process interventions.

Three different types of process interventions can be identified:
1. Knowledge management (KM) interventions;
2. Policy network (PN) interventions; and
3. Process management (PM) interventions.

We expect that each type of intervention can enhance the knowledge transfer and uptake of knowledge. We also expect that our sender-receiver model can help us to better understand the role of 'knowledge brokers'.

*Figure 4 (left). Dike strenghtening at Kinderdijk - Schoonhovense Veer (Case study see page 110-111; Photo courtesy Ellen Tromp).*

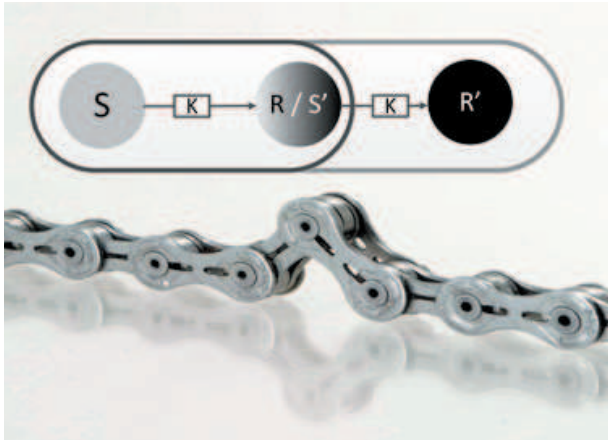


*Figure 5 (right). Knowledge transfer and uptake is as strong as the weakest link.*